# RUBBER WORLD

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OCTOBER, 1960

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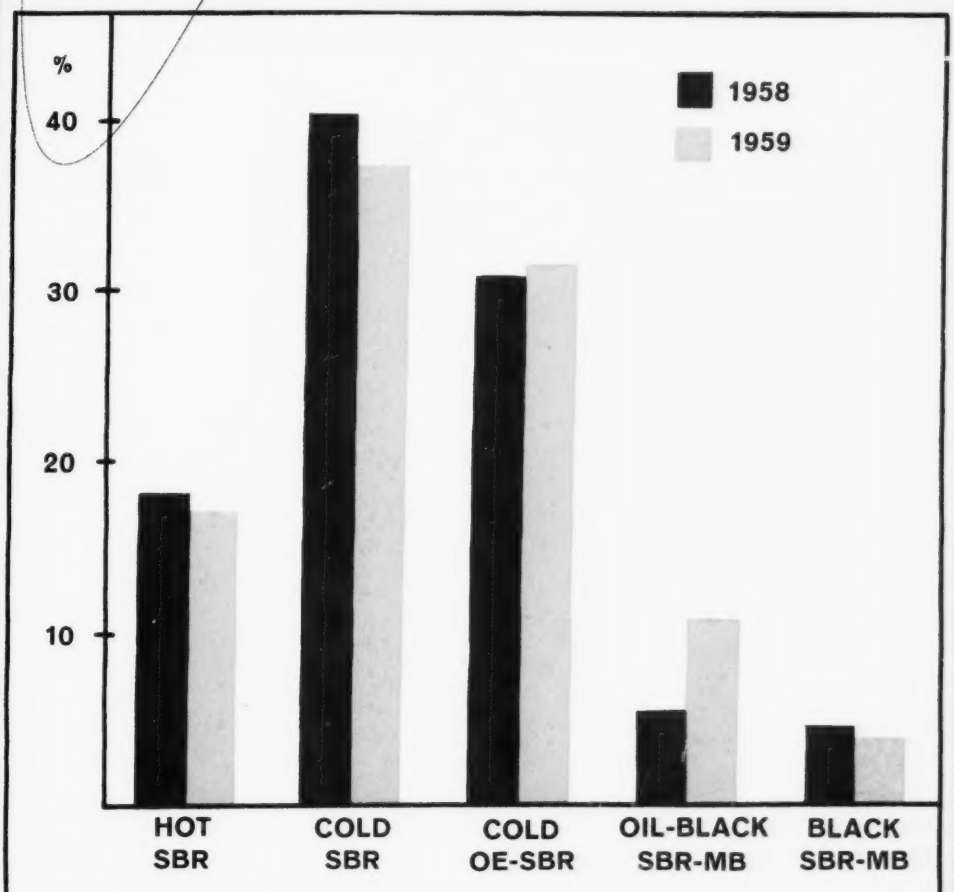


**PERCENTAGE OF TOTAL PRODUCTION OF SBR POLYMER TYPES**

ATTORNEY GENERAL MAKES HIS FIFTH ANNUAL REPORT ON COMPETITION IN SYNTHETIC RUBBER PRODUCTION

WHILE
CLAIMS
ARE
BOUNCED
AROUND

# BAYTOWN'S Ease of Processing
## Stands on Its Own Proven Historical Record

**IT IS A KNOWN FACT** that the processing ease and lowered manufacturing costs made possible by the uniformity of BAYTOWN'S masterbatches have made these products *the mark to beat.*

**AND NOW,** the new United-Barclay* Process – an *improved* manufacturing technique – increases processing superiority and allows longer service life (e.g. independent test track results show a 10 per cent increase in tread wear).

**THE SUM TOTAL of these incremental improvements is better Baytown Masterbatches**


UNITED CARBON COMPANY, INC.
410 PARK AVENUE, NEW YORK 22, N. Y.
A Subsidiary of United Carbon Company
AKRON CHICAGO LOS ANGELES
BOSTON HOUSTON MEMPHIS
In Canada: CANADIAN INDUSTRIES LIMITED


UNITED CARBON

*Patents Pending

Full-scale commercial production of the following new transportation and mechanical goods dispersant-free, black masterbatches is now underway—

BAYTOWN 1811
100 parts SBR polymer
75 parts SRF black
17.5 parts highly aromatic processing oil
rosin/staining

BAYTOWN 8675
100 parts SBR polymer
50 parts HAF black
9 parts naphthenic processing oil
rosin/staining

BAYTOWN 8677
100 parts SBR polymer
52 parts HAF black
10 parts highly aromatic processing oil
rosin/staining

BAYTOWN 8680
100 parts SBR polymer
52 parts HAF black
15 parts highly aromatic processing oil
rosin/staining

BAYTOWN 8681
100 parts SBR polymer
50 parts ISAF black
15 parts highly aromatic processing oil
rosin/staining

BAYTOWN 8775
100 parts SBR polymer
75 parts HAF black
37.5 parts aromatic extending oil
mixed/staining

BAYTOWN 8776
100 parts SBR polymer
50 parts HAF black
37.5 parts naphthenic oil
mixed/non-staining

BAYTOWN 8778
100 parts SBR polymer
75 parts HAF black
37.5 parts highly aromatic extending oil
12.5 parts highly aromatic processing oil
mixed/staining

BAYTOWN 8779
100 parts SBR polymer
75 parts HAF black
37.5 parts naphthenic extending oil
12.5 parts naphthenic processing oil
mixed/non-staining

BAYTOWN 8781
100 parts SBR polymer
55 parts ISAF black
37.5 parts aromatic oil
mixed/staining

BAYTOWN...THE BIRTHPLACE OF BLACK MASTERBATCH

*Another new development using*

# B.F.Goodrich Chemical *raw materials*

## THIS NEW HYCAR RUBBER OFFERS UNIQUE COMBINATION OF PROPERTIES

**HYCAR 1000X145.** Makers of a variety of products should find the advantages of this new modified polybutadiene polymer of interest. Its abrasion resistance is excellent—as is its lack of brittleness at low temperatures. Electrical properties are good; ozone resistance is good. Oil resistance is moderate.

Suggested applications include primary electrical insulation, shoe soles and heel lifts, rolls where abrasion resistance is important, on coated fabrics and hose coverings.

If you would like samples or more information on Hycar 1000X145, or any other Hycar rubbers and latices, write Department FB-10, B. F. Goodrich Chemical Co., 3135 Euclid Ave., Cleveland 15, O. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

**Hycar** *Rubber and Latex*

**B. F. Goodrich Chemical Company**
**a division of The B. F. Goodrich Company**

*See our catalog in Sweet's Product Design File*

**B.F.Goodrich** GEON vinyls • HYCAR rubber and latex • GOOD-RITE chemicals and plasticizers

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VOLUME 143 NUMBER 1 OCTOBER, 1960

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Cover photo: Data from Fifth Annual Report of the Attorney General (see page 119)

**SERVING THE RUBBER INDUSTRY SINCE 1889**

A BILL BROTHERS PUBLICATION

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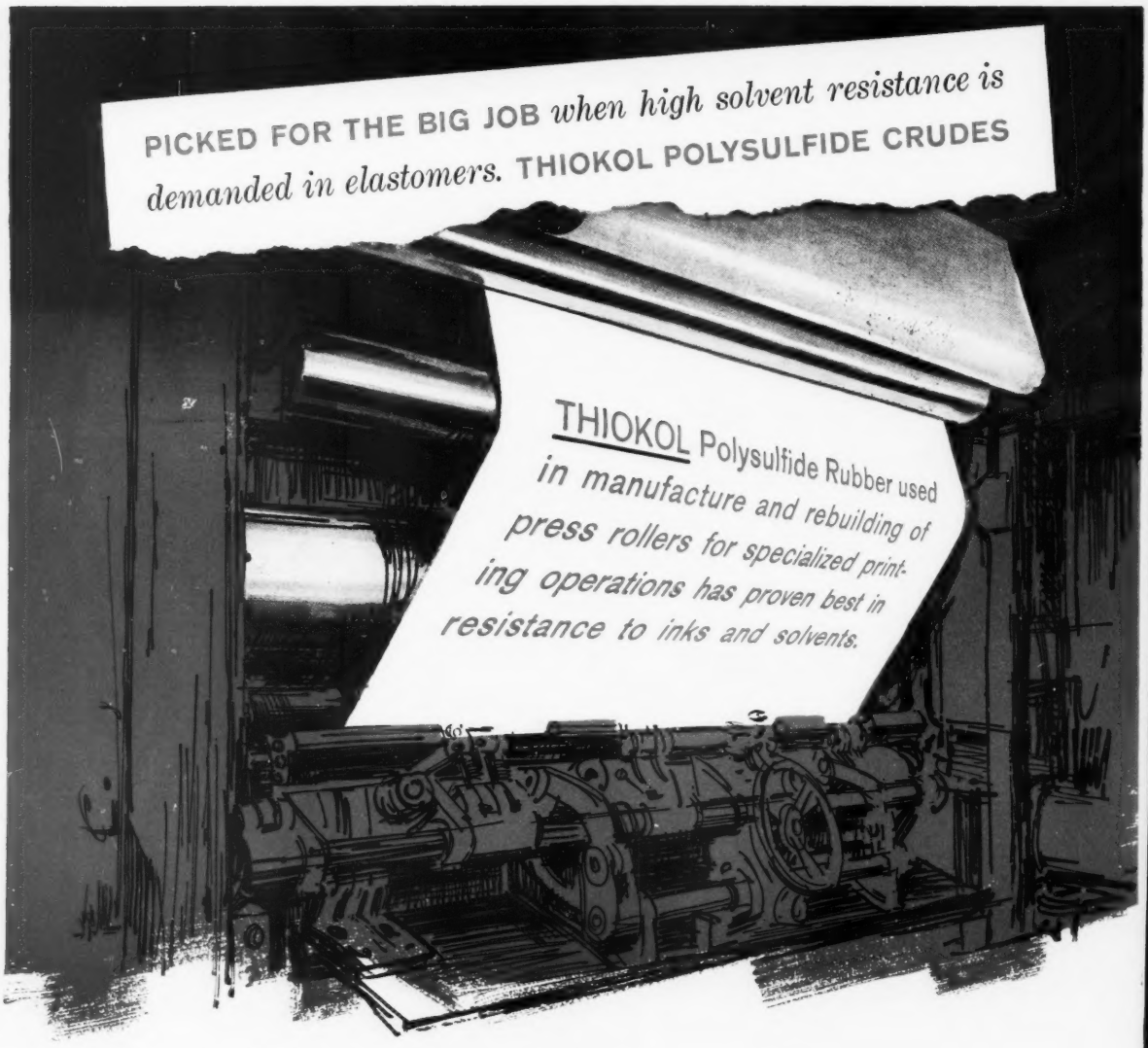
PICKED FOR THE BIG JOB when high solvent resistance is demanded in elastomers. THIOKOL POLYSULFIDE CRUDES
THIOKOL Polysulfide Rubber used in manufacture and rebuilding of press rollers for specialized printing operations has proven best in resistance to inks and solvents.

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# news of the rubber world

October, 1960

The United Rubber, Cork, Linoleum & Plastics Workers of America elected a new president at the biennial convention held in St. Louis last month. George Burdon will take on the duties of this office from retiring L. S. Buckmaster, who has served as URW president for the past 15 years. Peter Bomarito, who ran with Burdon, was elected international vice president. Buckmaster received much praise and a number of gifts at a surprise party given by the union in recognition of his years of work for the URW.

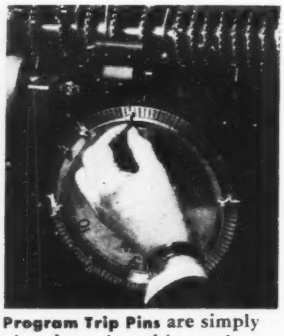
The Rubber Division, ACS, also held elections during the month of September. Here, again, changes in long-standing officerships took effect. W. S. Coe was chosen chairman. G. E. Popp retired as Division treasurer and was successful in his bid for vice chairman. The treasurership passes to D. H. Behney. L. H. Howland, former assistant secretary, was elected to pick up the secretary's work from retiring R. H. Gerke, who served the Division well in this capacity. The meeting was quite successful in spite of competition from the presidential campaign and New York's attractions.

The UN General Assembly session is very hard to forget for very long at a time in RUBBER WORLD'S offices which are within sound of the New York City police convoys carrying their VIP cargoes to and from that meeting. One stops to speculate from time to time as to what developments in the world crises in Africa, Cuba, and Communist countries will have further immediate effects on segments of the rubber industry as well as the overriding hopes for world peace.

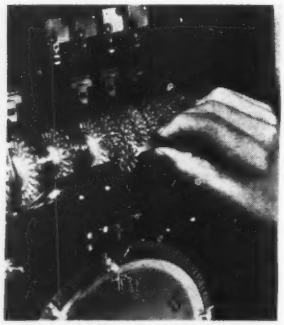
The Rubber Manufacturers Association through its divisions interested in industrial products will study ways and means of stimulating courses in engineering colleges and universities on rubber as an engineering material. Current curriculas cover many materials, but omit rubber, with the result that many design engineers fail to utilize our product well.

# *New Taylor* **FLEX-O-TIMER**® *Timed-Program Controller...*

## *gives you—*



**Program Trip Pins** are simply placed at selected intervals, set screws tightened with an Allen wrench.



**Step Cams** fit snugly into step disc notches, are easily bolted into place, never have to be adjusted.

- Up to 12 pneumatic and/or electric functions
- Faster, easier setting of Program Trip Pins
- Positive acting air valves with more than 3 times previous output capacity

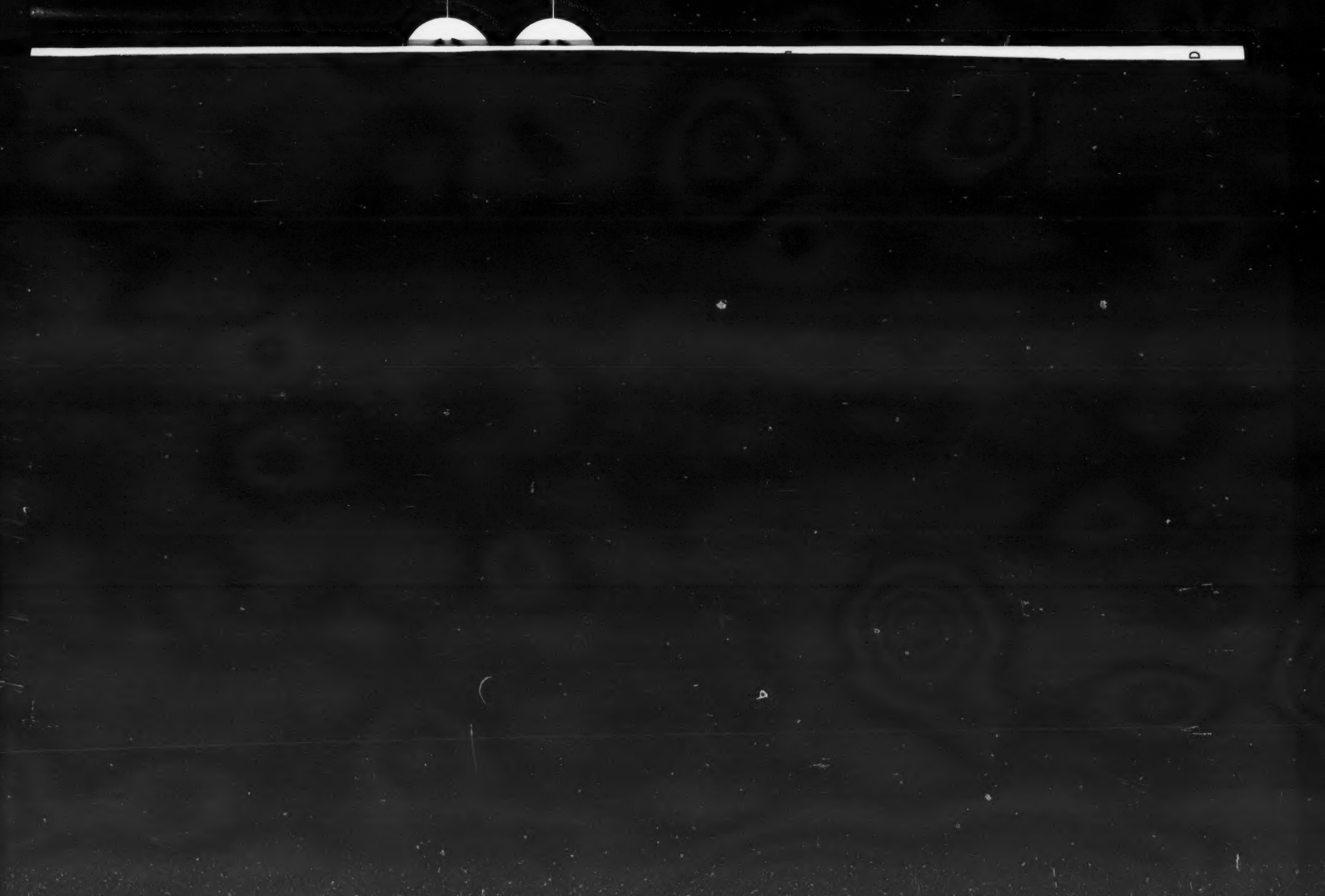
Recognized for many years as a highly versatile "robot brain" for the precise timing and coordination of batch processes, this new FLEX-O-TIMER Controller has been made even more simple to operate, more precise in its control. It is ideal for providing completely automatic time control for tire presses, particularly for nylon cord tires requiring additional functions; platen presses; or any process requiring precise timing of process sequence and duration involving temperature, pressure, mechanical motion, electrical energy, or any combination thereof.

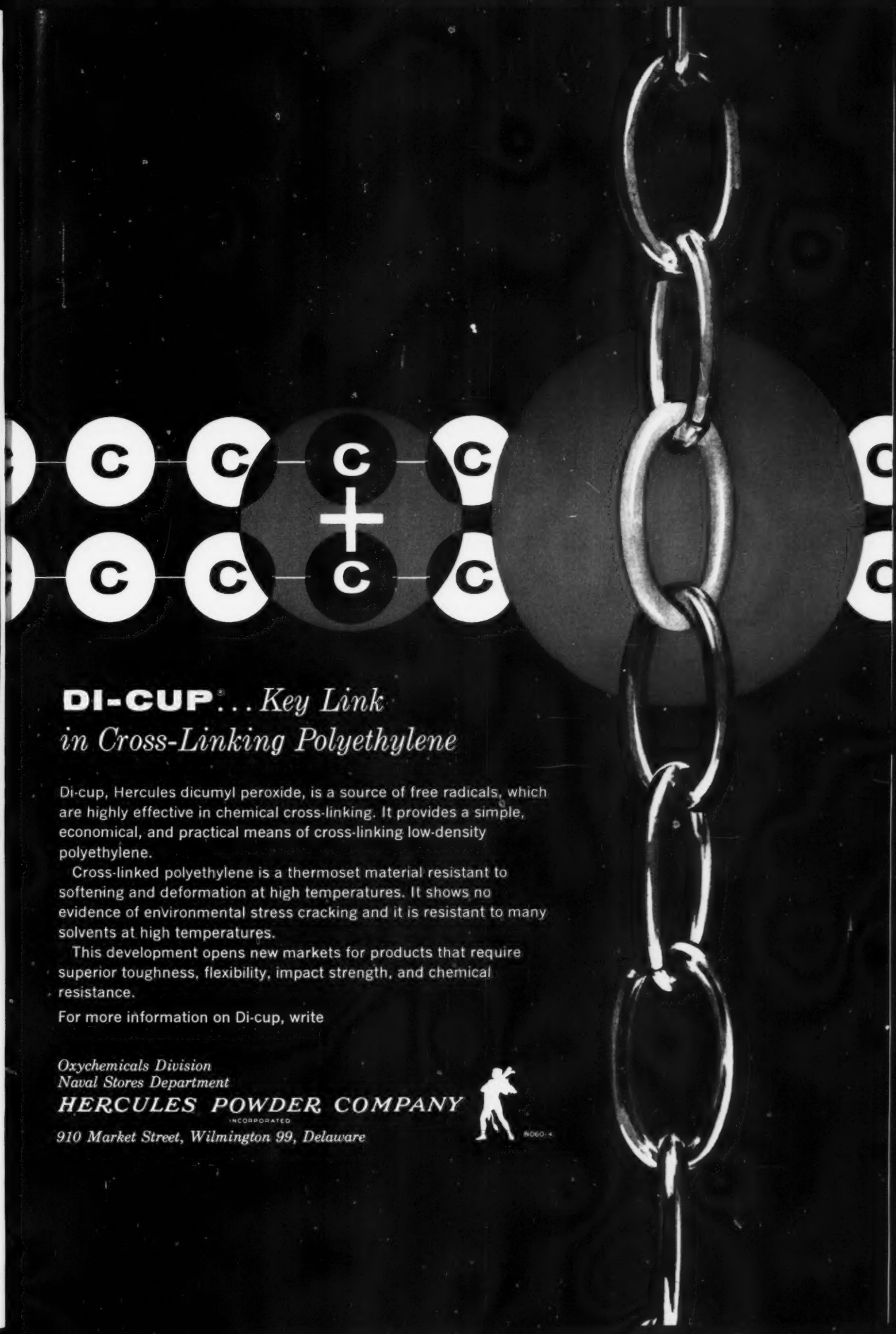
As well as the three major improvements listed above, the new FLEX-O-TIMER Controller incorporates these plus features:

- Extremely short time intervals between steps (with high accuracy) can be accommodated . . . 7½ seconds on 30 minute cycle dial; minimums on other dials in same ratio.
- Cycle range is quickly adjustable for 15 to 60 minutes for high-speed range. 1 to 16 hours for low-speed range.
- Time dial automatically resets to zero in maximum of 13 seconds at completion of cycle.

Ask your Taylor Field Engineer for full details, or write for **Bulletin 98373.** Taylor Instrument Companies, Rochester, New York, and Toronto, Ontario

*Taylor Instruments* ***MEAN ACCURACY FIRST***






# DI-CUP®... *Key Link in Cross-Linking Polyethylene*

Di-cup, Hercules dicumyl peroxide, is a source of free radicals, which are highly effective in chemical cross-linking. It provides a simple, economical, and practical means of cross-linking low-density polyethylene.

Cross-linked polyethylene is a thermoset material resistant to softening and deformation at high temperatures. It shows no evidence of environmental stress cracking and it is resistant to many solvents at high temperatures.

This development opens new markets for products that require superior toughness, flexibility, impact strength, and chemical resistance.

For more information on Di-cup, write

*Oxychemicals Division*
*Naval Stores Department*
**HERCULES POWDER COMPANY**
INCORPORATED
*910 Market Street, Wilmington 99, Delaware*

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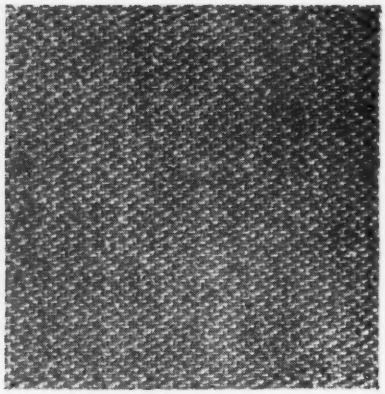
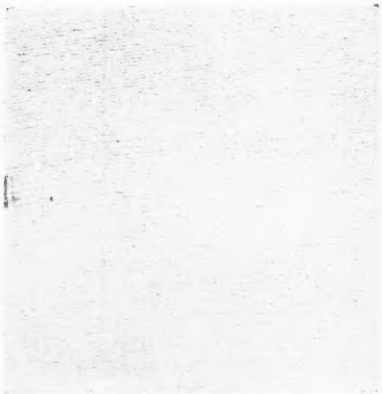
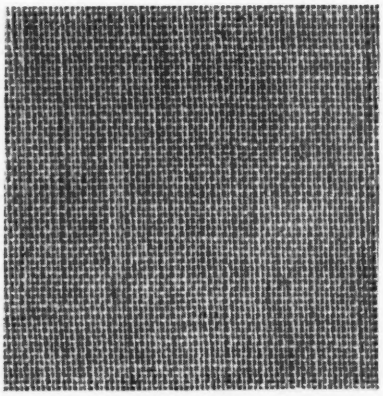
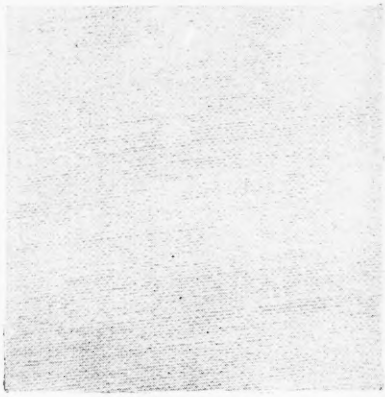
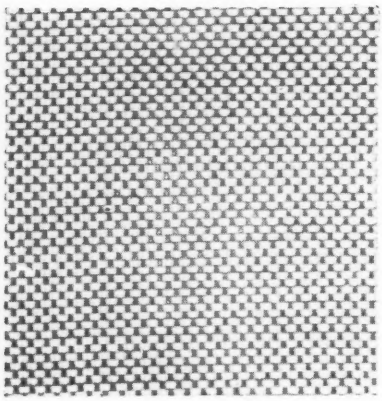

Cotton Broken Twill

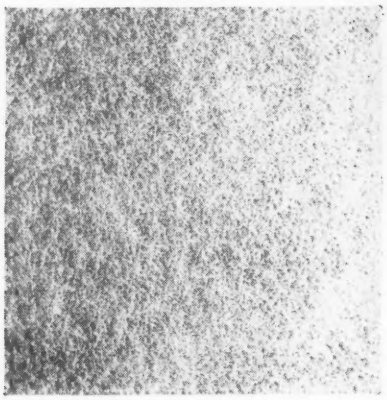

Spun Dynel


Cotton Chafer


Spun Rayon


Welkote Filament Nylon

Knit Kote


Lantuck

Shown here is just a tiny sample of the many quality base fabrics offered by Wellington Sears for both plastic and rubber coating. The entire selection is more complete and up-to-the-minute than can be found anywhere else in the textile industry.

There are wovens, non-wovens and knits in cotton and synthetics for every coating application. All are continuously proving themselves—in a variety of uses ranging from air-supported domes and collapsible fuel tanks to luggage, upholstery and garments.

Leading companies at home and abroad rely on the century-long experience of Wellington Sears in supplying fabrics to industry. When you have a problem, call on us. And, in the meantime, write for our free illustrated booklet "Fabrics Plus," Dept. H-10.

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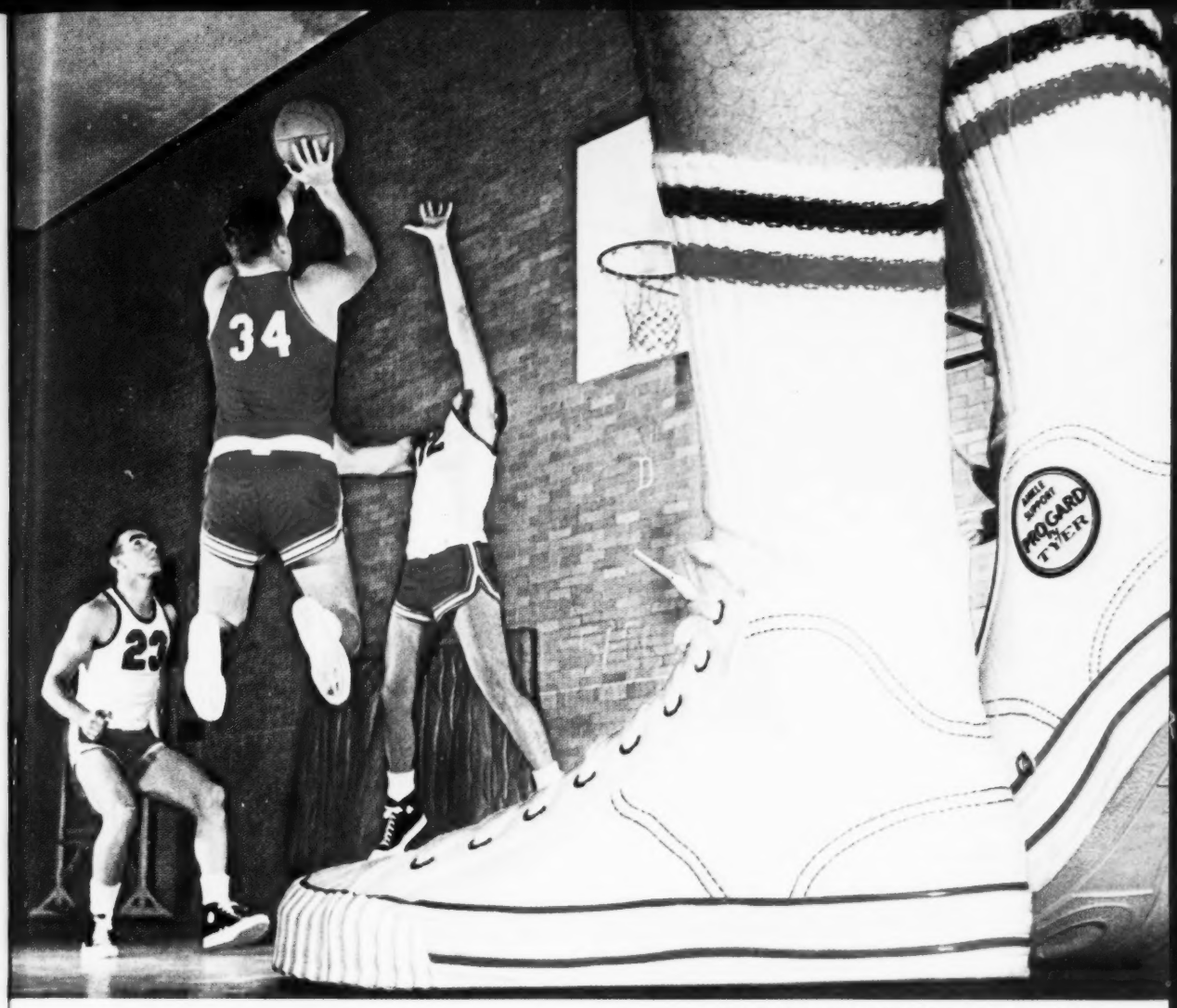



Footwear manufactured by Tyer Rubber Company, Andover, Mass.

# How to get the jump on competition

**You can't miss** with a quality product that's got an exclusive feature of wide appeal. For example, consider the basketball shoes above. They offer everything you'd expect—sure-footed traction, light weight, good resilience, attractive appearance, easy washability—*plus* an "exclusive" that's caught on fast.

**This sales-sparking "extra"** is a combination ankle support and protective guard that's built right into the shoe. To produce this unique feature, a versatile sponge rubber compound was needed. Chosen: PLIOFLEX—for its unrivaled uniformity and good blowing characteristics.

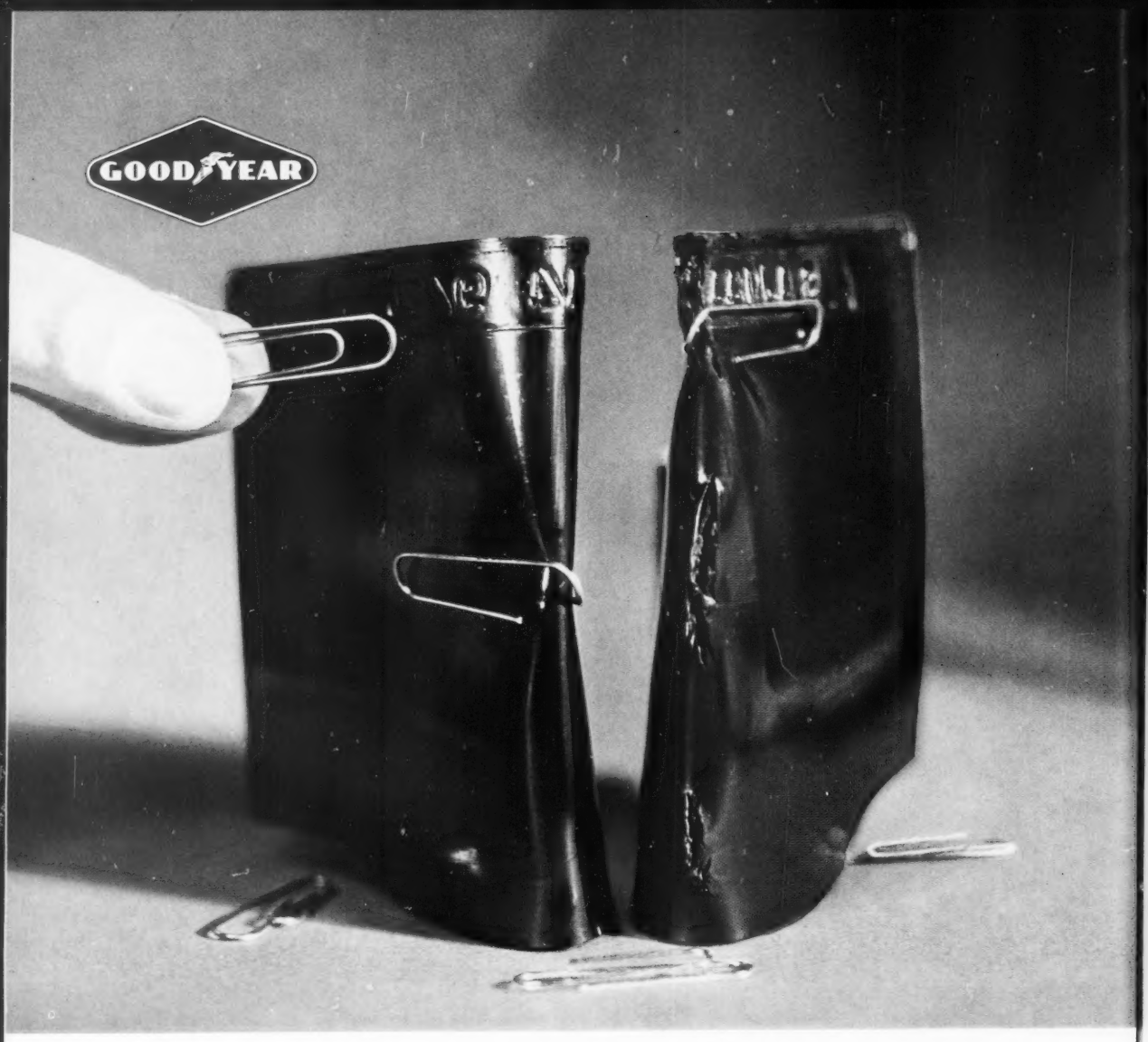
**In other parts** of the shoe, PLIOFLEX was used because of its light color and remarkable retention of calendered designs. In the sole, PLIOFLEX provides outstanding nonslip qualities and exceptional flexibility. It also assures better adhesion of rubber to canvas. Throughout the shoe, PLIOFLEX means long wear. And—happily for the manufacturer—PLIOFLEX usually means a substantial reduction in costs.

**If you're looking for a compound** that can put your product on a better competitive footing, it will pay you to look into PLIOFLEX—now used in more products than any other synthetic rubber. For complete information, write Goodyear, Chemical Division, Dept. V-9-18, Akron 16, Ohio.

GOODYEAR

CHEMICAL DIVISION

Pliofle – T. M. The Goodyear Tire & Rubber Company, Akron, Ohio




## CHEMI-VIC puts you on the right track against ozone attack!

***The basic feature*** of new CHEMI-VIC is well described in the photograph above. That's CHEMI-VIC on the left, compared to a similar, currently popular elastomer, after 144 hours in an ozone box (100 pphm) at 100°F.

***CHEMI-VIC is brand new***—a vinyl reinforced nitrile elastomer. In addition to outstanding resistance to ozone and weather, it offers high physical properties plus exceptional resistance to oil. Moreover, it's easy to compound and process on standard equipment.

***New CHEMI-VIC is available*** in two grades: CHEMI-VIC 400 for general purposes. CHEMI-VIC 800 for extrusion and calendering application. Typical uses: hose, belting, wire and cable jacketing, weather stripping, integral molded shoe soles. More information? Just write Goodyear, Chemical Division, Dept. V-9418, Akron 16, Ohio.

**Lots of good things come from**

# GOODYEAR

## CHEMICAL DIVISION

Chemi-Vic—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

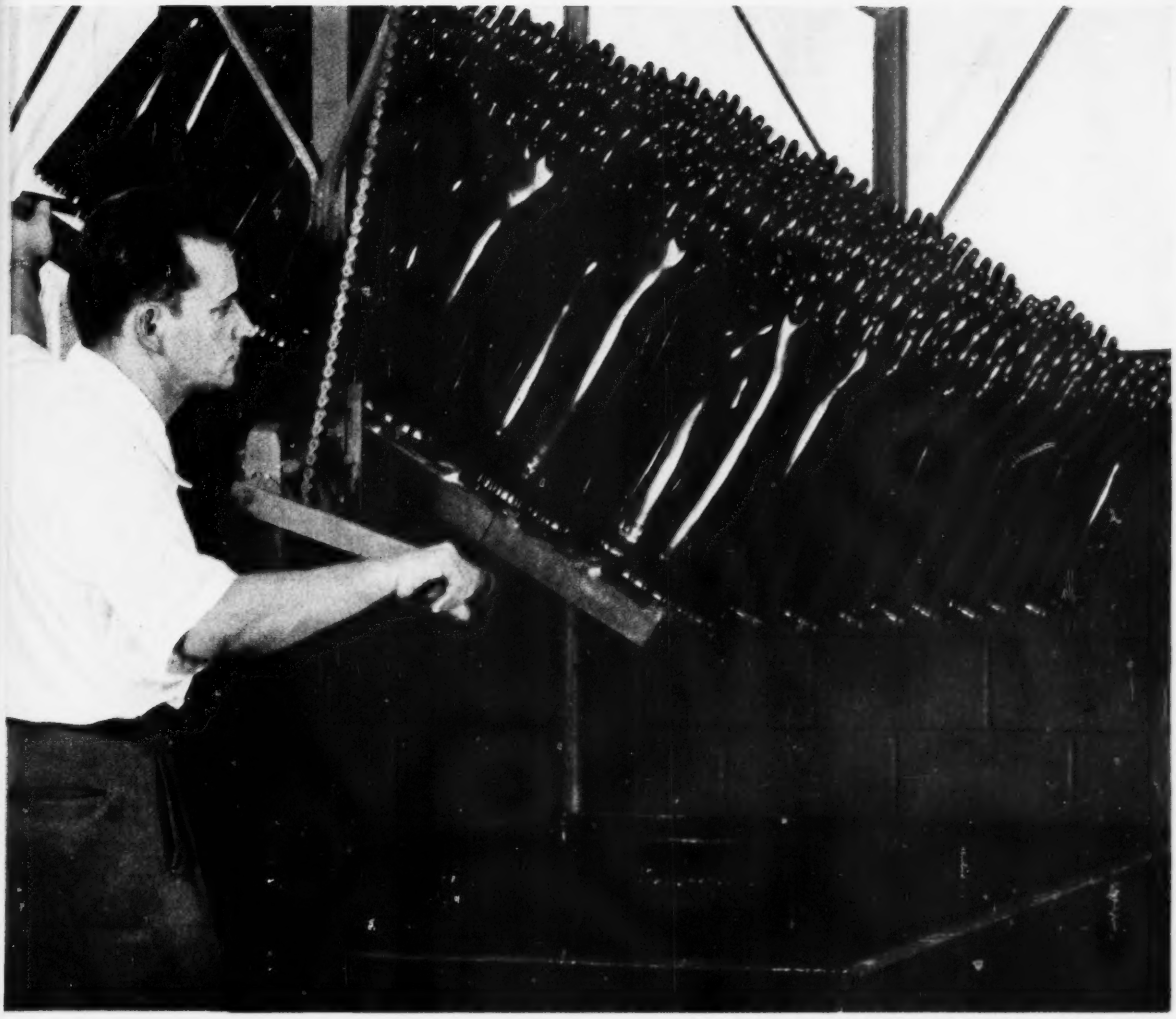


Photo taken through the courtesy of Charleston Rubber Company, Charleston, S. C.

# Chemigum gives protection with a "plus"

**Handling "hot" chemicals** calls for safety gloves with unique properties. Not only must these gloves resist the strongest kind of chemical action, they must also remain soft and pliant. They must offer this "plus" without puncturing, distorting or tearing.

**Impossible requirements?** Not for CHEMIGUM, the original nitrile rubber by Goodyear. A leading manufacturer in the field of safety wearing apparel has found that CHEMIGUM more than fills the bill of requirements, with the added advantage of exceptional oil- and solvent-resistance.

**What's more, Chemigum** is easy to process. It is readily milled – quickly forms uniform, stable, true molecular solvent solutions which, through multiple dipping, produce gloves of greater protective and wearing qualities.

**If you can use** an outstanding oil- and chemical-resistant rubber with outstanding processing properties, it will pay you to learn more about CHEMIGUM. For complete information–including latest *Tech Book Bulletins*–write: Goodyear, Chemical Division, Dept. V-9118 Akron 16, Ohio.

GOODYEAR

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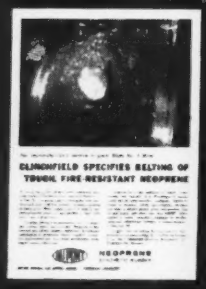
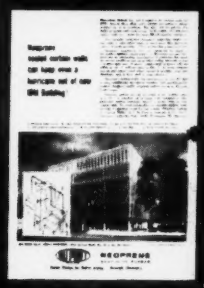
Chemigum – T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

# HOW DU PONT NEOPRENE, PLUS CONSISTENT PROMOTIONAL SUPPORT, HELPS CREATE ADDED SALES APPEAL FOR YOUR PRODUCTS





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Coal Age
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Electrical Construction and Maintenance
Electrical West
Electric Light & Power
Electrical World
Electrified Industry

**MAINTENANCE**
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Plant Engineering
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Fortune
Scientific American

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REG. U. S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

When a single synthetic rubber demonstrates, for more than 25 years, its ability to improve product performance and give long, dependable service life under the most rigorous conditions, that's *one* kind of sales power — and reason enough for using Du Pont *neoprene* in the products you process or manufacture.

## ALL-OUT SALES SUPPORT

Couple this with a quarter century of advertising and promotional support geared expressly to help *you* make this sales power pay off, and you've got a combination that's difficult to match. This year, for instance, extensive advertising — examples of which you see here — continues to reach your customers . . . informing them of new applications for neoprene . . . reminding them of its consistent performance record . . . *selling* them on the properties of this versatile elastomer.

Many of your customers learn the facts about neoprene through subscriptions to such Du Pont publications as ELASTOMERS NOTEBOOK, ELASTOMER NEWS FOR AUTOMOTIVE ENGINEERS, MAINTENANCE NEWS, WIRE AND CABLE CASEBOOK and assorted booklets, brochures and mailing pieces plus motion pictures and publicity . . . that spell out, clearly and convincingly, neoprene's ability to do a job. Still others have seen neoprene on the job at trade shows, such as the Society of Automotive Engineers, American Institute of Architects and Design Engineering Show.

## AN IMPORTANT SALES ASSET

To men in the rubber industry, neoprene offers an important added advantage: the extra selling power of its name. It's an advantage you can capitalize on easily. How? By putting the neoprene name to work, wherever possible, right on the rubber products you make . . . by merchandising it to your customers . . . by including it in your own advertising and promotional efforts. You'll find neoprene's reputation a vital selling tool.

For more information, plus a subscription to any of the Du Pont periodicals mentioned above, write: E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department RW-10, Wilmington 98, Delaware.

PROVED IN SERVICE

More than a quarter century of industrial service stands back of neoprene's reputation for quality and long-term economy. Because of its unique balanced combination of properties, neoprene affords excellent resistance to a wide variety of deteriorating elements, including heat and cold, ozone and weather, oil and grease, acids and chemicals, aging and abrasion. It's also flame resistant. That's why, in applications ranging from shoe soles and space suits to structural sealing gaskets, neoprene has earned the kind of widespread customer acceptance that stimulates sales.

# NEOPRENE
## SYNTHETIC RUBBER

7540-A

**No matter what your product,** process or problem involving white pigmentation, look to TITANOX® pigments and our technical service for the answer. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; offices and warehouses in principal cities. In Canada: Canadian Titanium Pigments Ltd., Montreal.

QBX-1 and QBX-1E, two new masterbatches from Marbon, are the most economical and efficient form of high-styrene resin reinforcement available today. Many of the time-consuming properties of less-efficient forms have been removed, with resultant increases in production and quality of end product. QBX-1 and QBX-1E, for general purpose and electrical grade, will meet and pass the most rigid tests. We will be happy to send you a sample for your own testing.

1. Uniform stacking and palletizing
2. Uniform diced 3/32" cubes
3. Faster, cleaner, more accurate weigh-up (for both manual and automatic weigh systems)
4. Excellent dispersion (specific masterbatching eliminated)
5. No need for exacting temperature control in mixing
6. Faster mixing cycles
7. Lower power requirements

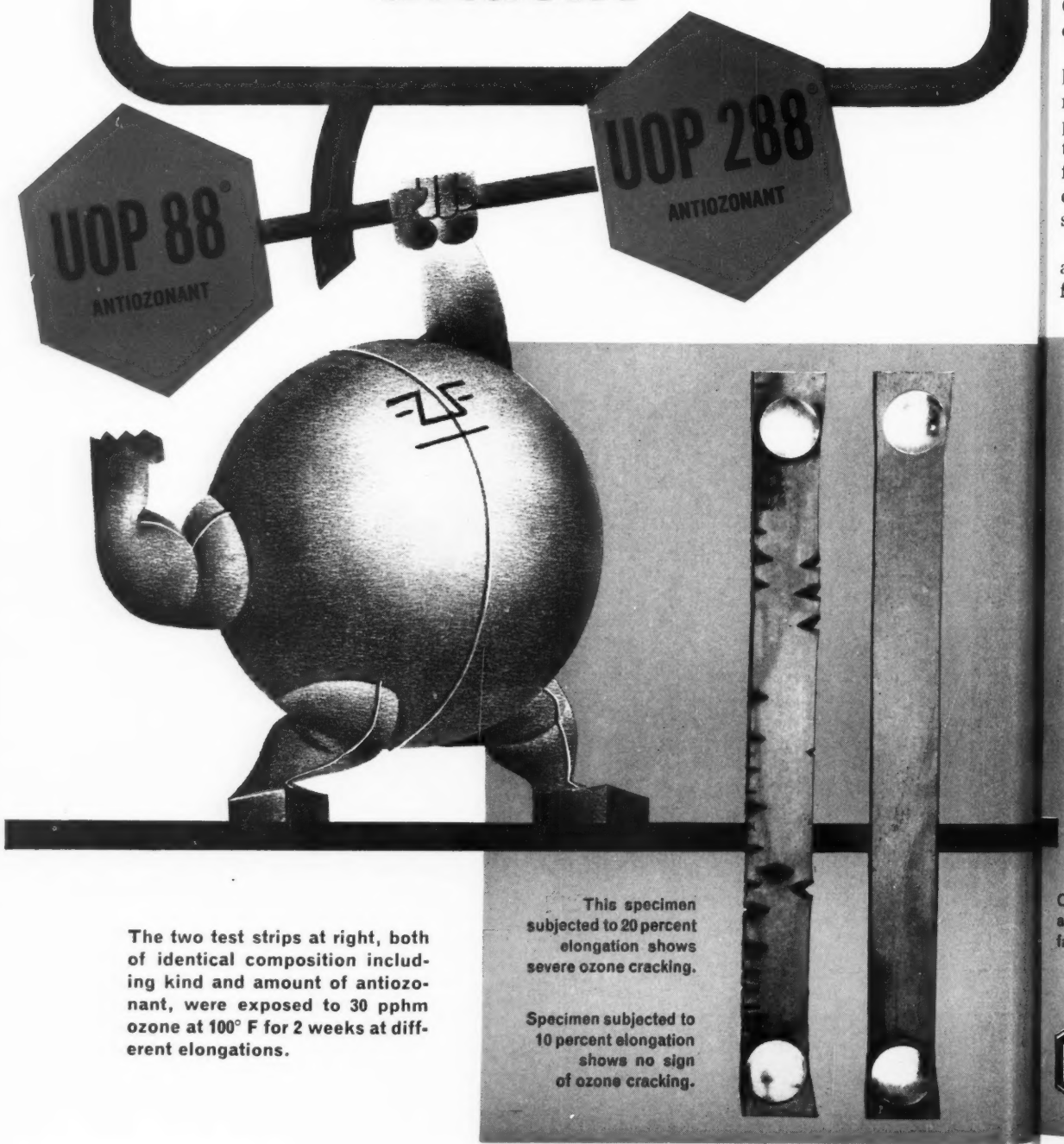
*QBX is a trademark of BORG-WARNER CORP.

MARBON CHEMICAL
WASHINGTON

MARBON B-W CHEMICAL

DIVISION BORG-WARNER
WEST VIRGINIA

# how can rubber under STRESS fight off ozone attack?




The two test strips at right, both of identical composition including kind and amount of antiozonant, were exposed to 30 pphm ozone at 100° F for 2 weeks at different elongations.

This specimen subjected to 20 percent elongation shows severe ozone cracking.

Specimen subjected to 10 percent elongation shows no sign of ozone cracking.

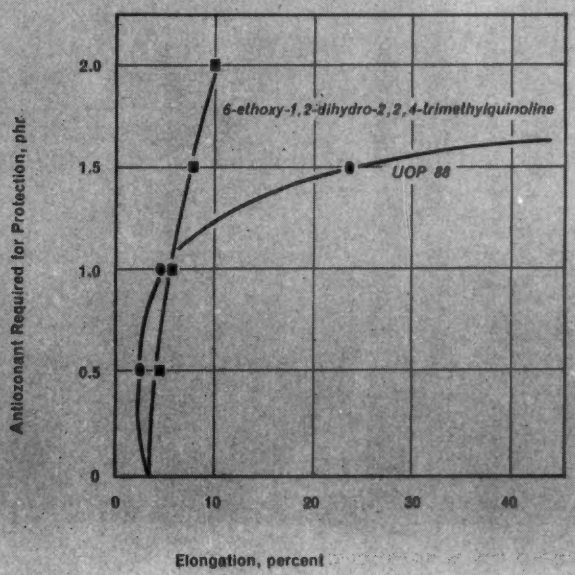
## properly formulated, rubber can withstand ozone, even under severe dynamic service . . .

What happens to a well formulated rubber compound when the vulcanized product is subjected to inherent or applied stresses?

The photos of test strips below give a graphic answer: Ozone attacks the surface of the product and severe cracks develop.

Hence the need for special ozone protection in products likely to be subjected to such service. And special protection means the kind provided by UOP 88 and 288. Unlike other protective measures, UOP antiozonants extend their protection to products under heavy physical stress and dynamic flexing. With a relatively small increase in amount, you can give your product sufficient ozone protection to withstand greatly increased stresses.

In working out rubber formulations involving the use of antiozonants avail yourself of UOP technical service and facilities. Just write or telephone our Products Department.

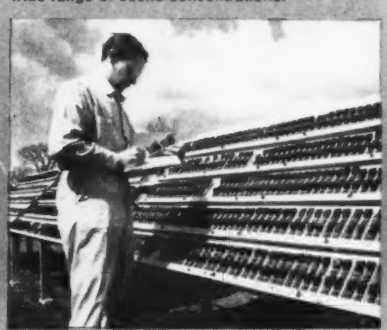



Curves plotted for UOP 88 and a competitive antiozonant show that while antiozonant requirement increases with increased strain, it does so at a far lower rate for UOP 88 than for the competitive material.

*To cover all phases of service conditions, UOP rubber labs conduct dynamic and static tests both indoors and outdoors.*

DeMattia flexer is used to evaluate flex-cracking properties of compounds tested in UOP rubber laboratory.

UOP ozone cabinets provide test conditions at a wide range of ozone concentrations.

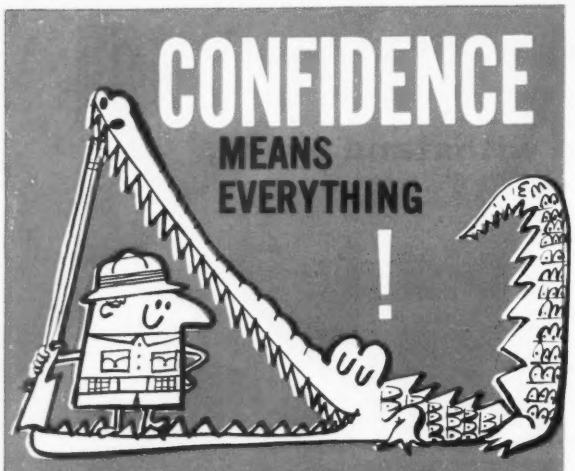


Test specimens mounted on outdoor racks are examined at regular intervals for evidence of deterioration.

UOP

**UNIVERSAL OIL PRODUCTS COMPANY**

**30 Algonquin Road, Des Plaines, Illinois, U.S.A.**

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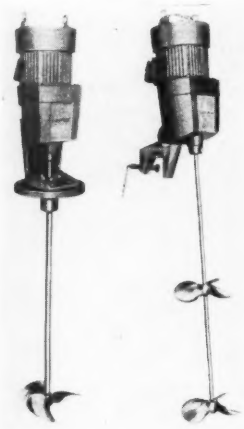
"Rubber Pigment Technology at its best"


# new equipment

## Alfa Laboratory Cutter

Thwing-Albert Instrument Co., Philadelphia, Pa., has developed a new Alfa laboratory cutter to cut any type of non-metallic sheet up to five inches in diameter for penetration of vapor transmission tests, and irregular shapes up to eight inches in length. The cutter can cut circular, rectangular, square, or odd-shape samples easily when the operator lifts out one cutting die and replaces it with another, the manufacturer says.

## New "Lightnin" Mixer Line



"Lightnin" mixers recently introduced include fixed mount *(left)* and portable

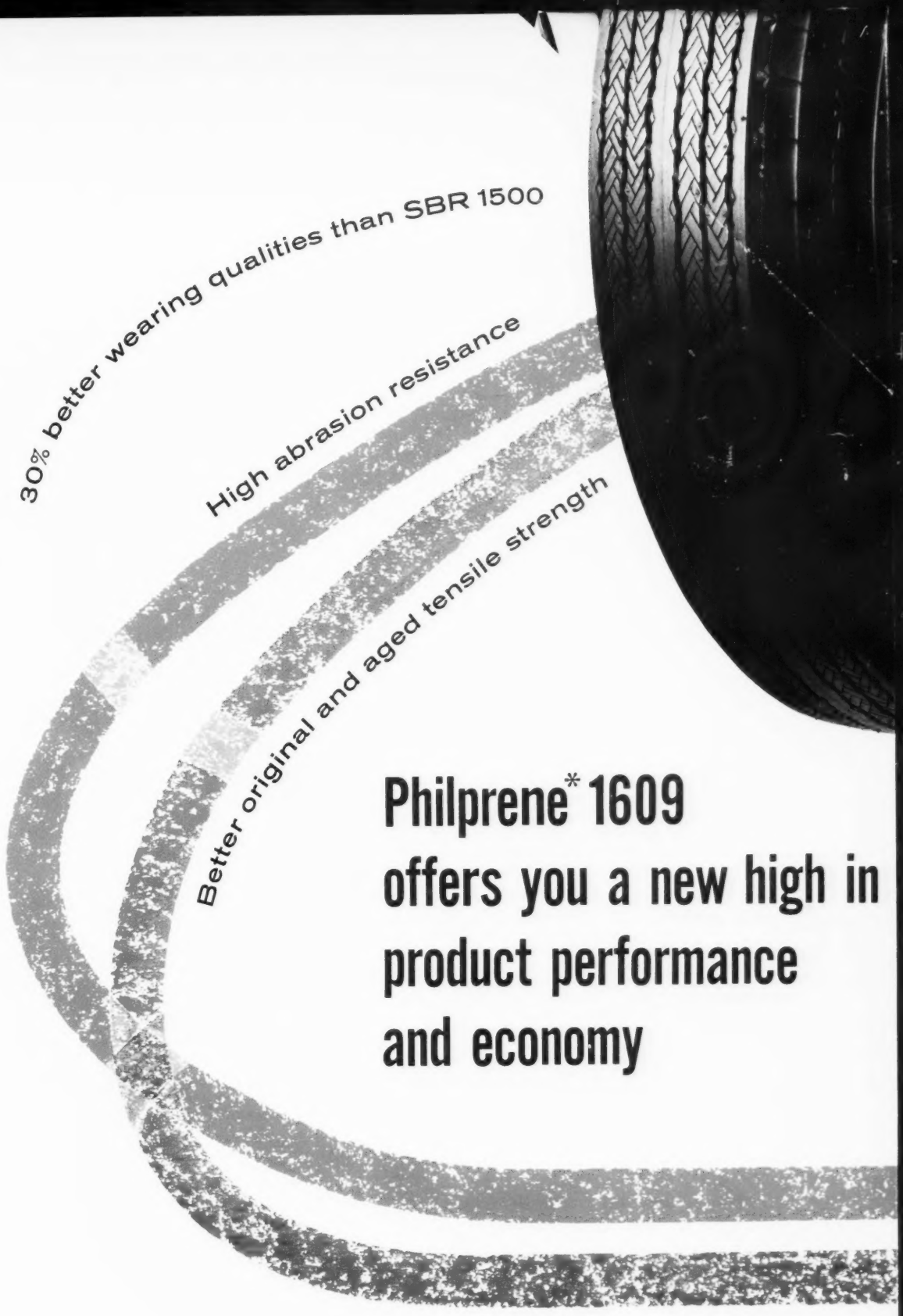
A new line of "Lightnin" propeller-type mixers for fluid agitation in process industries has been announced by Mixing Equipment Co., Inc., Rochester, N. Y. The new mixer comes in both portable and fixed mounting models, the portable model in sizes ranging from ⅛ to 3 hp., and the fixed mounting model in all but the ⅛-hp. sizes.

The new mixers come in direct-drive speeds of 1750 rpm. and 1150 rpm. and a gear-driven model speed of 350 rpm. Both direct and gear-drive models rotate clockwise. Gear-drive models, said by the manufacturer to be quiet running, are equipped with single reduction, internal helical gears, with a new, positive drive that permits coupling in one operation. Motors come in either totally enclosed or explosion-proof models.

Standard single or dual super-pitch propellers are offered in a new design series which the manufacturer says is chosen for the best combination of flow and head characteristics to cover a broad range of mixer applications.

Both direct and gear-drive models require no lubrication or adjustment under normal operating conditions for five years, it is further claimed.

*(Continued on page 28)*




# Philprene* 1609 offers you a new high in product performance and economy

Superior scorch resistance

Less temperature build-up

Resists cracking • Good shelf life

Philprene 1609 cracks down on cracks! It's the first masterbatch to combine outstanding crack resistance with maximum abrasion resistance. A supreme quality polymer, *realistically priced*, this masterbatch has been used with great success by manufacturers of premium quality tire tread stock, retreads, tank tracks, industrial belting and specialty items.

You get superior dispersion because Philprene 1609 is made by the Philjet* Process. It's easier, cleaner to handle. Because this is a Phillips Chemical Company product, you can be sure of uniformity, high quality and dependable supply. Your Phillips technical representative can give you full information about Philprene 1609. Phillips research staff and modern technical laboratory stand ready to help on specific rubber problems and your individual recipes.

*A trademark

**PHILLIPS CHEMICAL COMPANY**

318 Water Street • Akron 8, Ohio

# Follow the trend to a supreme quality tread stock

# How you can find "extra" hours to spend with your family

Like so many key production men, you probably spend a lot of evenings and Saturdays solving rubber production problems. Philprene will not relieve you of a full work week. But if you start specifying easy processing Philprene polymers, you'll discover "extra" hours to spend with your family. Here's why:

**Phillips research and product development** brings you the newest product developments, carefully tested to minimize trial-and-error in your plant.

**Phillips dependable delivery** from key warehouse points helps you maintain flexible production planning with a minimum of inventory.

**Phillips sales service laboratories** assist you in your continuing programs of improving your products and services.

**Phillips technical sales service** provides in-plant assistance on everyday production problems, keeps you advised of new processing techniques.

**Phillips quality control** of Philprene polymers helps you reduce shut-downs on the production line, lets you market uniformly high quality products.

**Phillips technical information** keeps you abreast of new ideas in the rubber field.

Let your Phillips representative demonstrate all the unique advantages of Philprene polymers.

PHILLIPS 66

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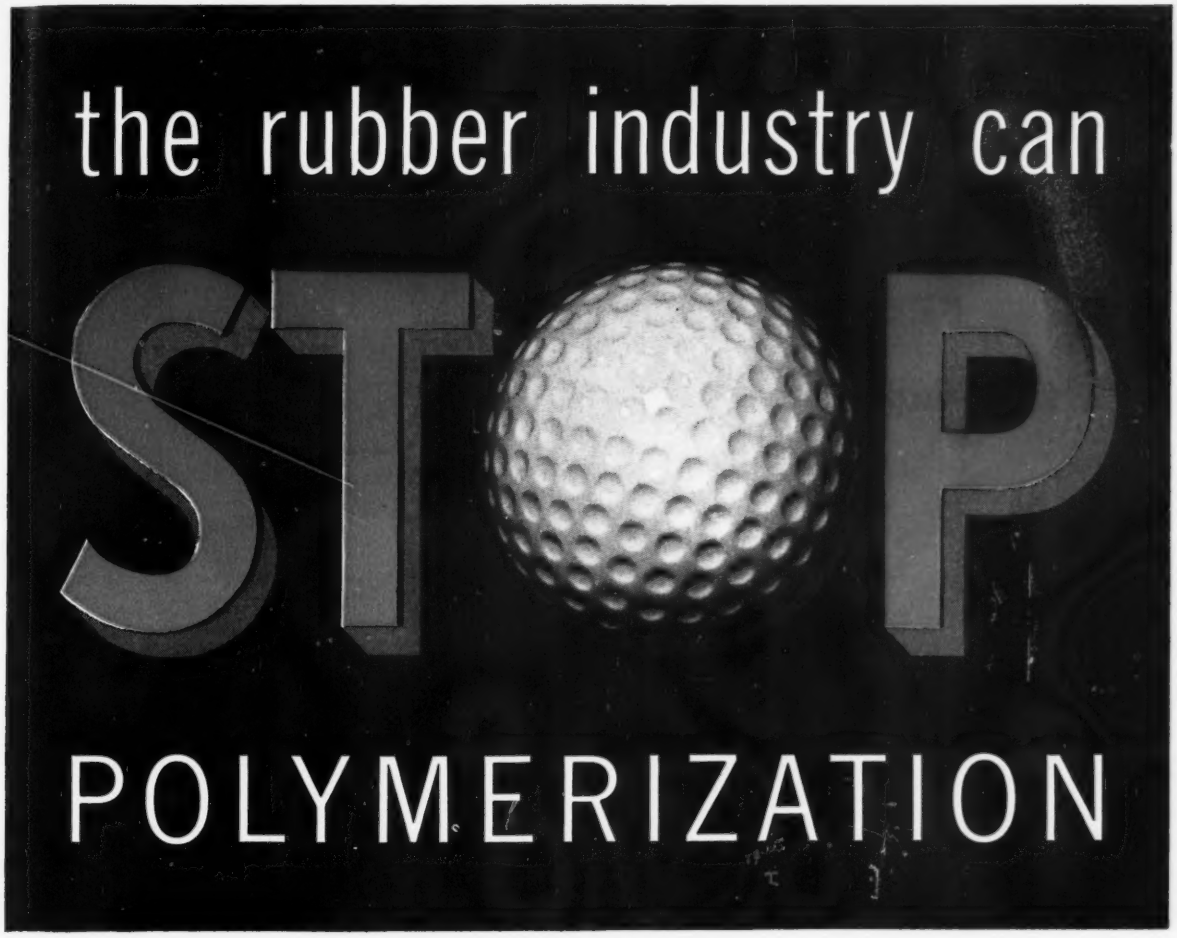
*West Coast:* Harwick Standard Chemical Company, Los Angeles, California

*Export Sales:* Phillips Petroleum International Corporation • Sumatrastrasse 27, Zurich 6, Switzerland

Distributors of Phillips Chemical Company Products • 80 Broadway, New York 5, N. Y.




## with

# HYDROXYLAMMONIUM SULFATE

Hydroxylammonium Sulfate—$(NH_2OH)_2 \cdot H_2SO_4$—is an excellent non-discoloring short stopper for use with peroxide-catalyzed polymerizations. It is used in the production of butadiene-acrylonitrile rubber and other polymers.

| Physical Properties | HYDROXYLAMMONIUM SULFATE |
|---|---|
| Formula | $(NH_2OH)_2 \cdot H_2SO_4$ |
| Molecular Weight | 164.14 |
| Melting Point, °C | 177* |
| pH of 0.1 M Aqueous Solution at 25°C | 3.7 |
| Solubility in 25°C, g 100 g solvent | |
| In Water | 63.9 |
| In 95% Ethanol | 0.2 |
| In Methanol | 0.1 |

*Melts with decomposition.

"HS" destroys the peroxide polymerization catalyst as soon as polymerization has progressed to the desired stage. Products of decomposition are oxides of nitrogen which do not remain in the final product. "HS" is adaptable to both hot and cold polymerizations.

Some reports indicate improvement of rubber quality when "HS" is used. It has been found, too, that on a cost-efficiency basis, Hydroxylammonium Sulfate actually is more economical than some commonly used short stoppers.

*Write for sample and technical data.*

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**See Them All—**

**Then See**

**FRENCH**

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(illus: 4710)

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These four combined side-plate presses offer true economy in both price and floor space. Let our engineers help you fight high costs. Investigate our complete range of standard sizes before you make your press investment.

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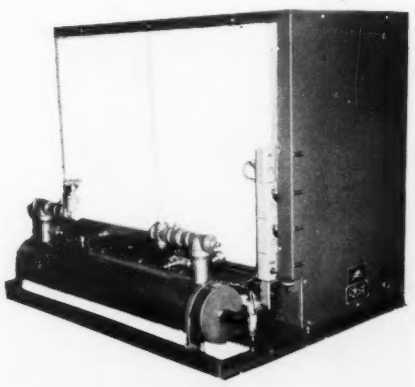
1022 Greene St., Piqua, Ohio


## new equipment

*(Continued from page 22)*



Multitem water chiller-heat pump unit

### Multitem Industrial Water Chiller

A new system for water chilling and recovery for process work has been developed by Application Engineering Corp., Franklin Park, Ill. Key to the system is the Multitem, a compact versatile temperature control unit that provides rapid cooling for increasing production of injection molding, extruding, or similar forming processes. Multitem Model TP is a complete, self-contained chilling system, including water pump and water storage tank ready for function upon connection to the process.

Multiple units can be installed based on current production, and more units added to accommodate future increases in production. Multitem Model S does not contain pump or tank and may be connected in multiple to a central water pump and collection tank.

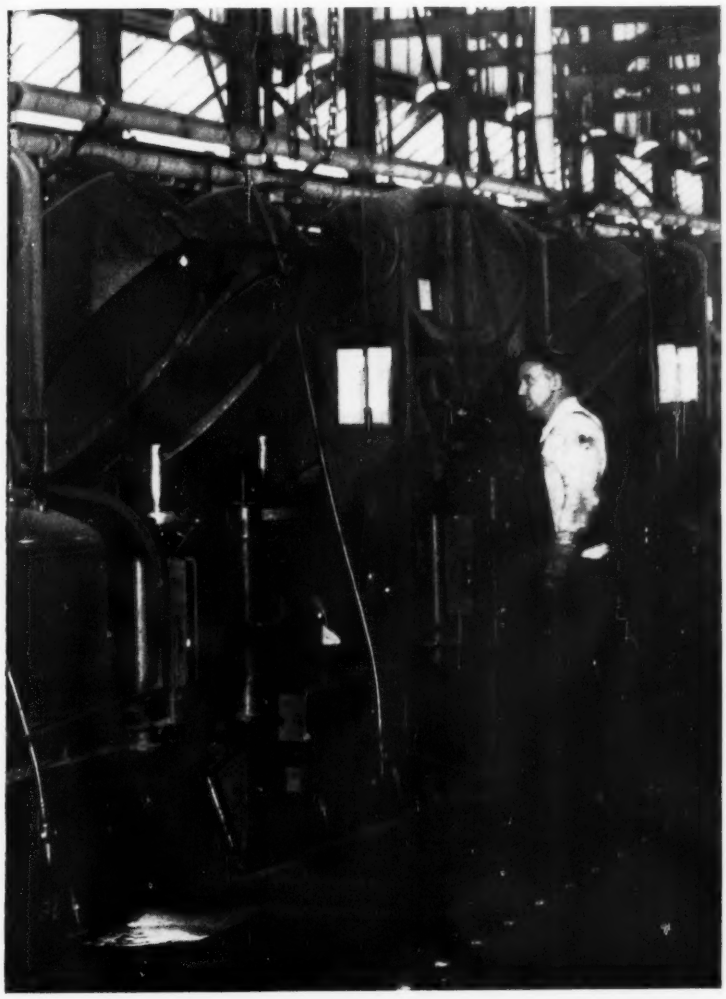
Chilling component and all piping are insulated to prevent condensation. Refrigerant is non-toxic, and refrigerant capacity control valves are standard on all models.

### Portable Ozone Recorder

Model 725-3b portable ozone recorder has been introduced by Mast Development Co., Inc., Davenport, Iowa. The instrument includes the Model 724-1 ozone meter, which can be purchased separately, a six-inch strip recorder, and a weatherproof case. The case is to make it possible to place the ozone meter outdoors, connected by a cable as much as a quarter mile long, and the strip chart recorder in the laboratory.

The meter is based on the Micro-Coulomb Sensor, exclusively licensed to Mast Development Co. Oxidation-reduction of potassium iodide contained in the sensing solution causes a flow of current through the meter circuit. The meter will operate unattended for three days, and will operate on 110 volts a.c. current with a power requirement of 100 watts.

# Keep Production Moving



***Serviceability Unlimited!*** Water dilutable emulsions, solvent soluble fluids, greaselike compounds, or spray formulations — there's a Dow Corning release agent to solve release problems with any type of rubber or plastic.

Let Dow Corning field engineers help you select the silicone mold lubricant best for each application in your plant.

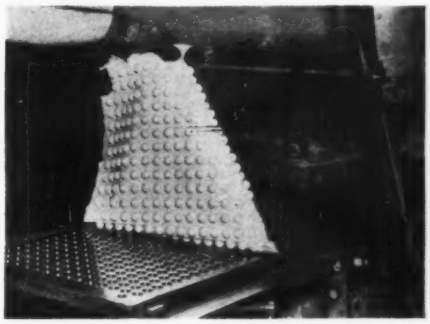
***Other Cost-Cutting Silicones*** that can save you time are silicone electrical insulation for mill and mixer motors; silicone paints that withstand heat, oxidation, and weathering; Silastic® gums and bases for compounding silicone rubbers for unusual service; and Syl-off® coated paper as interleaving sheets in slab molding polyurethane and as a "no-stick" packaging material for sticky products. Write for full information today. Address Dept. 7910.

## Silicone Mold Lubricants Give Fast, Clean Release with Minimum Build-up

Rubber and plastic products break away FAST and CLEAN from molds made "stick-free" with Dow Corning Silicones. These job-proved parting agents prevent sticking; assure good reproduction of fine surface detail; prevent tearing; keep rejects to a minimum.

Another money-saving feature: Heat resistant Dow Corning silicone release agents won't carbonize! Build-up on molds is negligible—meaning your mold cleaning costs go down, mold service life goes up.

In short, Dow Corning silicone mold lubricants help you mold superior products—help you maintain economical high speed production.

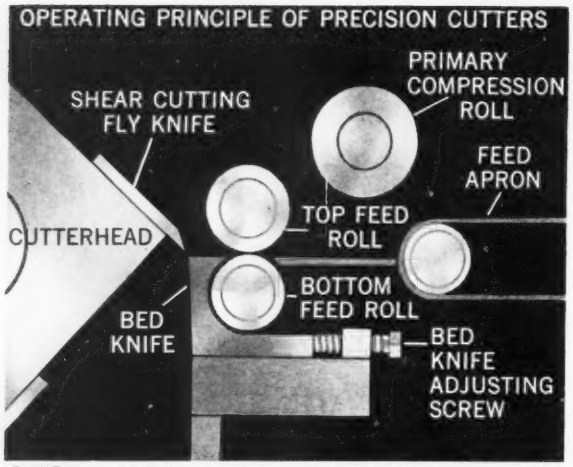


Your best source of technical assistance in adapting silicones to your products or operation is the Dow Corning office nearest you.

first in silicones

**Dow Corning CORPORATION**
MIDLAND, MICHIGAN

ATLANTA BOSTON CHICAGO CLEVELAND DALLAS LOS ANGELES NEW YORK WASHINGTON, D. C.




GIANT Precision Cutters are designed to take sheets, rods, filaments, or other materials that are long enough and uniform enough to be held firmly between top and bottom feed rolls in sketch above. In Taylor-Stiles Series 100 and Series 200 Cutters, the holding line or "pinch" is close to the point of cutting, where the fly knives meet the bed knife, thus insuring precise length of cut.

# SHEAR CUT RUBBER OR PLASTICS

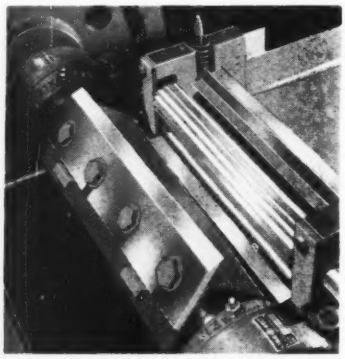
## ACCURATELY – ECONOMICALLY — EFFICIENTLY

Only GIANT machines use the shear cutting principle, the most efficient method of cutting known. This "single point" cutting produces a smooth action which minimizes vibration and strain and gives high production output with low power consumption. Other engineering features on all GIANT Cutters include: rugged construction; ease of accessibility to all working parts; long knife life and low cost of sharpening simple bevelled cutting edge; special design to relieve costly downtime and simplify servicing and cleaning; positive feed mechanism and varispeed motor for instant and accurate size change; capacities up to 20 tons per hour.

Taylor-Stiles offers a free sample cutting service for anyone interested in our machines. If you desire this service just send us a small sample of your product along with information as to size of cut. If you have a cutting problem call or write today, without obligation, for complete information.

FIG. G-117

Fig. G-117 shows a No. 115 Cutter with all guards removed. Stock enters on the feed apron, passes under a primary compression roll, then passes between the pair of feed rolls (bottom roll not visible), then across the top of the bed knife where the fly knives in the head make the shearing cut.



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**TAYLOR, STILES & COMPANY**

RIEGELSVILLE, NEW JERSEY, U.S.A.

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☐ I would like more information on your rubber cutters

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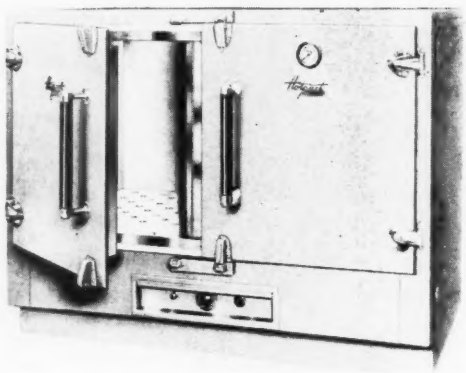
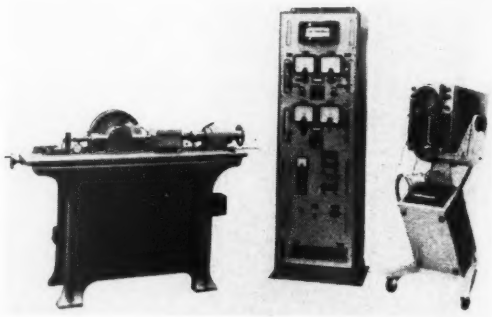
## new equipment



Electric Hotpack Co., Inc., Philadelphia, Pa., is now offering a double-door, under the counter oven, designed to save laboratory space. The oven, with a temperature range from 38 to 121° C., is used for artificial aging, drying, and other tests where controlled heating conditions are necessary. The polished steel interior chamber has a capacity of 11 cubic feet



Wallace electronic dynamic testing machine components showing test unit *(left)* control panel *(center)* and oscilloscope

### Electronic Dynamic Tester

The Wallace electronic dynamic testing machine, which can apply a dynamic strain to a test specimen in tension, shear, or compression, has been introduced by Testing Machines, Inc., Mineola, L. I., N. Y. The machine can provide a means of evaluating rubber compounds under dynamic conditions, or of studying the effect of design and shape on the dynamic behavior of molded components, the manufacturer says.

The machine has two temperature control chambers, one for low and one for high temperatures, both designed and insulated so that only the specimen is brought to the desired temperature. The machine permits adjustment of frequency, amplitude, and temperature, and a means of measuring static and dynamic values separately.

# hughson CHEMLOK® ADHESIVE DATA

UP-TO-DATE INFORMATION ON SPECIAL-PURPOSE ADHESIVES FOR INDUSTRY

## WHY CHEMLOK ADHESIVES LEAD

From a standing start in 1956, Chemlok Adhesives have become the most widely used rubber-to-metal adhesives in the world. There are clear-cut reasons for this quick acceptance of Chemlok 220 and 203.

Only Chemlok Adhesives bond the entire spectrum of commercial elastomers. Only Chemlok Adhesives offer all these performance advantages:

**Versatility:** One adhesive system bonds natural rubber, GR-S, butyl, neoprene and Buna N to all metals and many rigid plastics.

**Wide Manufacturing Tolerances:** Bonding is simplified by the wide latitude permissible in compounding, surface preparation, adhesive application, metal parts handling and molding technique.

**Environmental Resistance:** Maximum resistance to heat, hot and cold water, salt spray, chemicals, oil, solvents and corrosive atmospheres is obtained by use of Chemlok 203 and 220.

**One-Coat Application:** A single coat of Chemlok 220 outperforms most conventional two-coat systems, and has equivalent environmental resistance.

## HOW CHEMLOK ADHESIVES CAN SAVE YOU MONEY

**oat** — less adhesive, less labor, shorter cure time.

**dhesive** — avoids errors, simplifies inventory and application problems.

**scrap** — one firm cut scrap losses from poor bond 96%!

**r processing** — broad tolerances permit variations in elastomers, techniques, conditions.

## NEW DEVELOPMENTS

Among the experimental adhesives now available for evaluation are:

• Adhesive EX-B150-1 permits heat bonding of dissimilar unvulcanized elastomers. It is the first to provide successful rubber-to-rubber bonds between elastomer combinations previously thought impossible to join, particularly where one is based on butyl. Typical applications include conveyor belt covers to bodies, wire and cable jackets to insulation, hose covers, roll covers and multilayer gloves.

• Adhesive EX-B579-1 bonds RTV (room temperature vulcanizing) silicone rubbers to metals, glass, ceramics, plastics and fabrics. One-part, one-coat, nonstaining adhesive provides bonding during the room temperature cure. It meets electronics industry standards, offers excellent environmental resistance to broad temperature conditions.

## TECHNICAL LITERATURE

A letterhead request will bring you any of the following:

Technical Bulletin 2012 **"Chemlok Rubber-to-metal Adhesives"** presents comprehensive information on Chemlok 220 and 203.

Technical Bulletin 7101 **"Preparation of Substrates for Bonding"** is a valuable guide to proper surface preparation procedures.

**"Some Fundamental Aspects of the Problem of Rubber-to-metal Adhesion"** is the title of a technical article reprint which examines theoretical considerations in bonding.

Product bulletins and samples are available on all Chemlok Adhesives—standard, special, experimental. Please define your application area.

## SPECIAL-PURPOSE PRODUCTS

**Specialty Elastomer Adhesives:** Silicone rubber, Viton A, Hypalon and other specialty elastomers are successfully bonded to metals, fabrics and other materials with Chemlok 607.

**Surface Treatments:** Chemlok Surface Treatments for aluminum are now available. Research is being conducted on Chemical Surface Treatments for metals to enhance their adhesion to organic materials.

**Experimental Adhesives:** Unique products are now being sampled or are under development which will create design opportunities now impractical because of inadequacy of existing adhesive products.

If you would like information regarding our progress in any of these fields, please write us.

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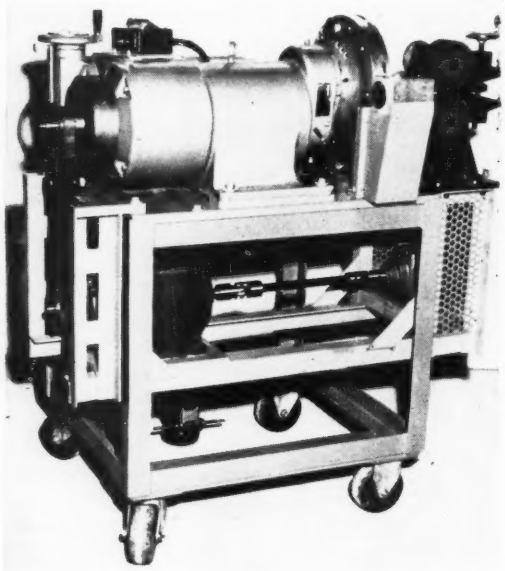
Akron, Boston, Chicago, Los Angeles, Trenton, Albertville, (Ala.), Denver, Greenville, S.C.

## new equipment

### High-Speed Balance

A new very high-speed laboratory balance, the "FW 55," is now available from C. H. Stoelting Co., Chicago, Ill., distributor for Mikrowa of Switzerland. The balance combines a direct-reading electro-optical scale with an automatic weight placing system operated by two dials.

The balance has a capacity of 200 gr. with a guaranteed accuracy of one mg. and a reproducibility of 0.5 mg., the distributor reports. It is further claimed that the optical scale of 10,200 mg. gives the "FW 55" capability of a speed at least three times as fast as other analytical balances in its class.



Model IV-S Versa cutter features synchronized Versa Feed take-off (upper right)

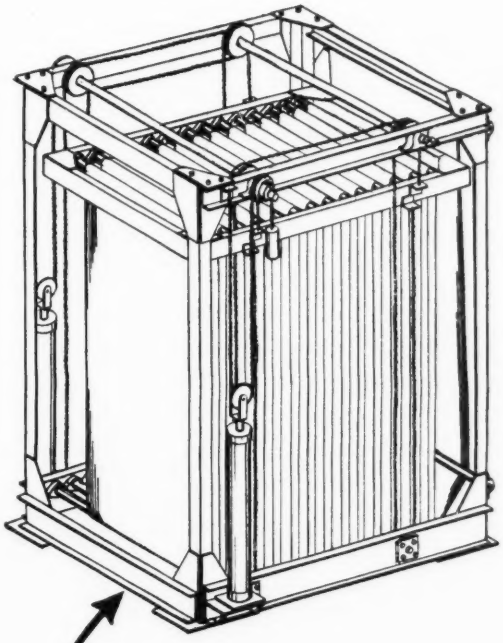
### Model IV-S Versa Cutter

The new Model IV-S Versa cutter for high-speed processing of extruded plastics, rubber, and other materials, designed and manufactured by Foster & Allen, Inc., Chatham, N. J., features precision pinch-roll take-off synchronized with the action of the cutting blade. In addition to this take-off, known as Versa Feed, the new model has a redesigned Series 200 Reeves Vari-Speed Motodrive with wider speed variation, smoother power flow, and longer belt life.

The Reeves unit is specially equipped with a 1.5 hp. synchro-speed motor which maintains a predetermined speed despite any voltage fluctuation.

The new pinch rolls can be used to replace the take-off unit on extruding machines, as well as to control the feed to the cutter. The Versa Feed pinch-roll take-off is also available separately, without drive, for use in a wide variety of operations.

# TIRE FABRIC PROCESSING EQUIPMENT



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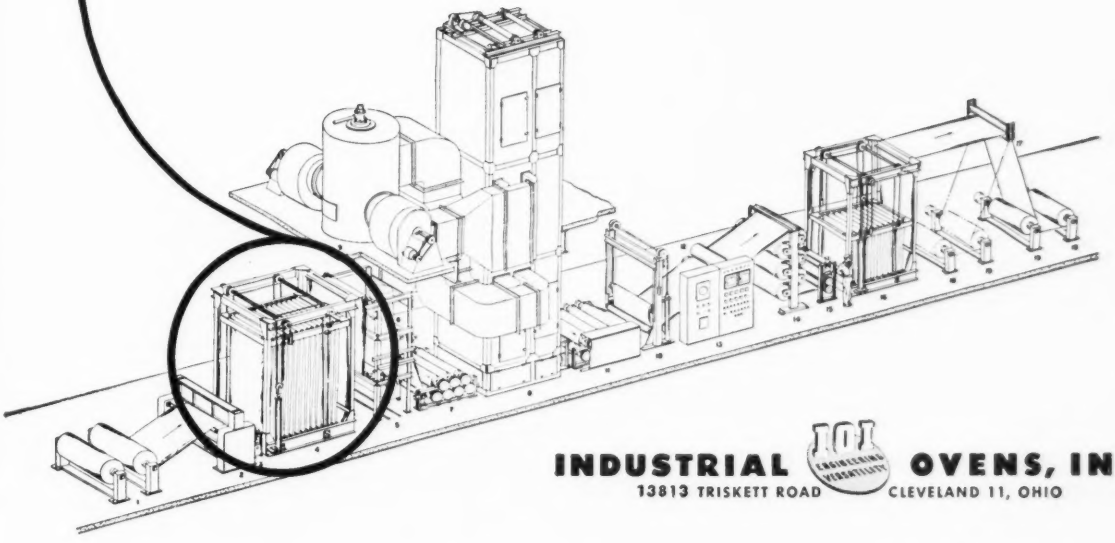

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## new products

A technician shows the silhouette of the new six-rib tread of the Silvertown tire introduced by The B. F. Goodrich Co. Eliminating one from the conventional seven treads allows heavier outside treads. The amount of extra rubber in the outside ribs is shown in white. The company says this construction allows the tire to run 25% longer before the outside ribs run smooth, the point where most drivers either trade in their tires or have them retreaded.

### Rubber-Covered Doors

American Hard Rubber Co., division of Amerace Corp., is now producing rubber-covered access doors for industrial plants to withstand the shock impact of fork-lift trucks as they pass through.

The "Ace Durador" is completely sheathed in rubber, ¼-inch at the bottom and ⅛-inch at the top, with an edge of ¾-inch soft rubber and an all-rubber hinge which runs the complete length of the door and seals against drafts as well as protecting the back edge of the door.

The rubber sheathing and hinges are said to make the door resistant to corrosion, making it especially useful for chemical plants and industrial plants where there are corrosive fumes. The Durador is claimed to eliminate the need of electronic or mechanical

*(Continued on page 42)*

## *Strong Restraining Influences...*

### *Roebling Hose Reinforcing Wire*

Roebling Hose Wire, Hose Reinforcing Wire and Hose Wrapping Wire bear the stamp of Roebling's strict attention to constant uniformity. As with all Roebling wire products, each is wholly Roebling-made and Roebling-controlled, from open hearth to packaging. Tensile strength and forming qualities, finish and gage are of an excellence that proves itself in use.

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For further information on these and other Roebling quality products, write or call Roebling's, Wire and Cold Rolled Steel Products Division, Trenton 2, New Jersey.

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*Branch Offices in Principal Cities*
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**ROCKS ON THE RUN** – In the making by The Port of New York Authority, the second traffic level on one of the world's most beautiful bridges, the graceful George Washington Bridge that joins the Jersey shore to Manhattan Island. The end result . . . beauty pointed skyward, begins with down-to-earth digging, upheaval of earth, removal of rocks, change of terrain. Contractors George M. Brewster & Co., Inc., responsible for a tremendous amount of the work being done on the New Jersey approach to the new level, estimated removal of approximately four hundred thousand yards of rock and one hundred fifty thousand yards of dirt on their contracts alone. New approaches to the bridge had to be cut from huge solid rock cliffs. Much of this rock was processed for re-use on the job as stone backfill, and as concrete aggregate. Thirty-six-inch belts were used to convey the rock from processing plants to hoppers. The belts for this huge operation were made for George M. Brewster & Co., Inc. by Hewitt-Robins, the carcasses of which were made with Mount Vernon fabrics.

This is another example of how fabrics made by Mount Vernon Mills, Inc., and the industries they serve, are serving America. Mount Vernon engineers and its laboratory facilities are available to help you in the development of any new fabric or in the application of those already available.

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**YOU CAN'T CONTROL THE "FLOW" OF TRAFFIC ON THE ROAD -- But -- YOU CAN CONTROL THE "FLOW" IN YOUR PLANT!**

## use AQUAZINC KC CONCENTRATE

### to separate sheet or slab stock and lubricate with perfect tack control

Aquazinc KC Concentrate, a highly concentrated zinc stearate dispersion, is applied as a spray or dip. It does the following for you:

1. Eliminates the health and explosion hazards of dusting.
2. Eliminates the need for liners or cushions.
3. Gives smooth flowing stock plus perfect tack control (it's developed especially for sheet mill or slabbed stock).
4. Readily absorbed without affecting the stock.
5. Leaves a glossy, non-greasy finish that adds appearance appeal.

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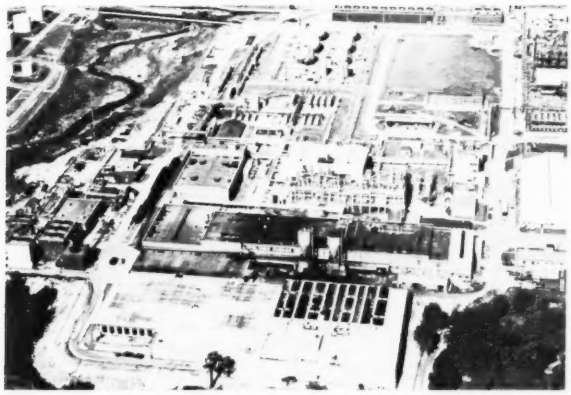
|---|---|
| **Minimum** time to process your orders | **MAXIMUM** efficient service. |
| **Minimum** of "split-shipments" | **MAXIMUM** availability of one or more products from one closely supervised source. |
| **Minimum** amount of handling | **MAXIMUM** protection against damage. |
| **Minimum** chance of error | **MAXIMUM** supervision by trained conscientious Copolymer personnel. |
| **Minimum** of delays | **MAXIMUM** SERVICE. |

This new on-plant warehouse at Copolymer will store large inventories of all types of rubber and still allow ample space for traffic. These modern facilities and close supervision will minimize the possibility of damage or errors.

Copolymer RUBBER & CHEMICAL CORPORATION

Phone Elgin 5-5655 P. O. Box 2591, Baton Rouge, Louisiana

# ..FOR YOU



In this aerial shot of Copolymer Butadiene and Rubber Plant, one can get an excellent idea of the size of the new warehouse, bottom foreground of the photo, by comparing it with the rest of the 60 acre plant.

**From his glass encased office in the warehouse area, our Traffic Manager can watch all orders being filled. Excellent lighting of the floor and the raised position of his office afford opportunity for close control of outgoing shipments.**

*Copolymer maintains off-plant warehouse facilities strategically located in Chicago, Akron, and Newark, N. J. to provide immediate service for the emergency needs of any buyer. Normal routine requirements will be filled from the new plant warehouse in Baton Rouge.*

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Extend the life and the original looks of your products and you build customer good will that reflects itself in greater sales and profits. Nothing will give them more stability, more protection against the inroads of age than Harchem Sebacate Plasticizers. Whether you seek resistance to heat, cold, water, weather or physical abuse, the key to your problem can be found in the chart of four Sebacic Acid Esters found below.

| Plasticizer | Specific Gravity 25°/25°C ±.003 | Viscosity 25°C, cps | Compatible With | Outstanding Characteristics |
|---|---|---|---|---|
| Dibenzyl Sebacate | 1.055 | 21-22 | Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers | Excellent Solvation, Very Low Volatility, Permanence, Good Electricals, Low Temp. Flexibility |
| Dibutyl Sebacate | 0.935 | 7.9 | Vinyl Resins, Cellulose Acetobutyrate, Synthetic Rubbers, Rubber Hydrochloride, Polymethyl Methacrylate | Low Temp. Flexibility, Excellent Aging Qualities, Non-Toxic |
| Dimethyl Sebacate | 0.986* | 3.54 @30°C | Vinyl Resins, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate, Acrylic Resins | High Solvency and Efficiency, Wide Compatibility, Concentrated Source of Sebacyl Radical |
| Dioctyl Sebacate | 0.913 | 17.4 | Polyvinyl Chloride and Copolymers, Polyvinyl Butyral, Synthetic Rubbers, Cellulose Nitrate, Cellulose Acetobutyrate | Excellent Low Temp. Flexibility, Low Volatility, Excellent Soapy Water Resistance, Good Electricals |

*30°/20°C

Columbian Carbon Company, Distributor To The Rubber Industry

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*CHEMICAL MATERIALS CATALOG PAGES 173-175*

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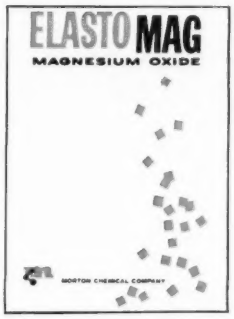


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# SAG 471

## Silicone Antifoam Fluid

Your UNION CARBIDE Silicones Man has closed an important gap—with new SAG 471 Silicone for defoaming latex and other products. It is a major addition to the successful SAG antifoams.

Where vigorous agitation is the problem and older types of antifoam fail—SAG 471 excels. And where other types lose their effectiveness after one operation, SAG 471 does the job for two consecutive operations.

Thus, SAG 471 serves even during violent agitation, and can save you money!

A southern manufacturer calls it the most effective silicone tested in controlling latex foam. And laboratory tests also confirm that it costs less than other agents in the ball-milling of pigment slurry for compounding latex emulsion.

Actually tested for months, following a three-year development program, SAG 471 is durable, more effective on a cost-of-defoaming basis, and it's ready to save you money now—in the manufacture of many products such as latex foams, adhesives, printing inks, and textiles.

Your UNION CARBIDE Silicones Man urges you to fill out and mail the coupon below for samples and technical data. Silicones Division, Union Carbide Corporation, 270 Park Avenue, New York 17, N.Y. *In Canada:* Bakelite Division, Union Carbide Canada Limited, Toronto 12.

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STREET _____

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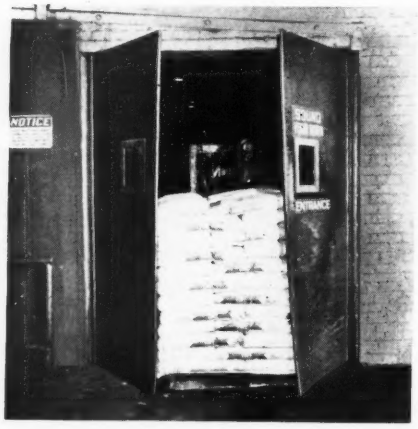
## new products

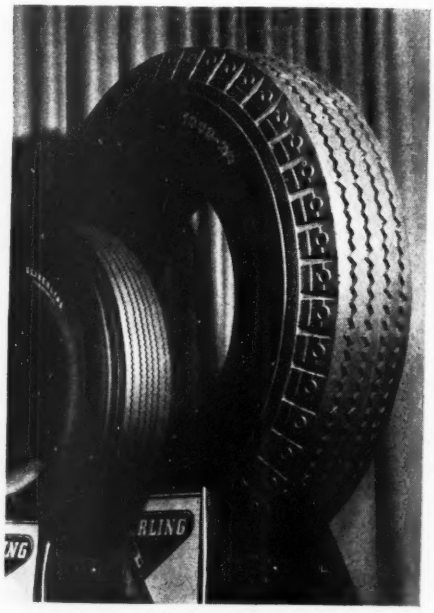
(*Continued from page 34*)




Rubber-covered access door rolls with the punch as fork lift truck slams through

door openers and to cut heat loss because of its tight construction.

The door comes in two models, heavy duty with a plywood core, and extra heavy duty with a fiberglass core.



Seiberling's Commercial, a truck-type tire *(left)* for station wagons, and a standard, heavy-duty truck tire *(right)*

### Improved Station Wagon Tire

Seiberling Rubber Co., Akron, O., recently introduced a new heavy-duty tire designed especially for

(*Continued on page 162*)

# Which one for your compound?

There's a difference between the METHYL and ETHYL compounds although both THIRAMS are exceptionally versatile primary accelerators, activators, and vulcanizing agents. A summary comparison is given in the tables below. To help you evaluate the THIRAMS on a cost-performance basis, we have prepared more detailed comparisons and compounding data. Ask for Bulletin S-164. Industrial Chemicals Division, PENNSALT CHEMICALS CORPORATION, Three Penn Center, Philadelphia 2, Pa.

**Pennsalt**

## METHYL THIRAM

(tetraMETHYLthiuram DIsulfide)

**Pennsalt**

## ETHYL THIRAM

(tetraETHYLthiuram DIsulfide)

| Hevea | PHR Thiram | T-5 @244°F | Cure Time @280°F | M300 | T | T-5 @244°F | Cure Time @280°F | M300 | T |
|---|---|---|---|---|---|---|---|---|---|
| no sulfur | 3.0 | 6.3 | 12½ | 1425 | 2950 | 9.8 | 25 | 1175 | 2875 |
| low sulfur | 1.0 | 10.6 | 10 | 1850 | 3375 | 19.4 | 12½ | 1425 | 3125 |
| high sulfur | 0.3 | 18.4 | 10 | 1800 | 3125 | 27.7 | 12½ | 1675 | 3150 |

| SBR 1500 | PHR Thiram | T-5 @262°F | Cure Time @298°F | M300 | T | T-5 @262°F | Cure Time @298°F | M300 | T |
|---|---|---|---|---|---|---|---|---|---|
| no sulfur | 3.0 | 9.2 | 15 | 925 | 2900 | 17.7 | 15 | 625 | 2275 |
| normal sulfur | 0.5 | 13.6 | 20 | 1900 | 2750 | 19.4 | 25 | 1625 | 2850 |
| normal sulfur | 0.7 | 13.0 | 20 | 2125 | 2450 | 14.8 | 25 | 1825 | 2700 |

| Nitrile | PHR Thiram | T-5 @262°F | Cure Time @320°F | M500 | T | T-5 @262°F | Cure Time @320°F | M500 | T |
|---|---|---|---|---|---|---|---|---|---|
| no sulfur | 2.0 | 20.7 | 7½ | 1025 | 2275 | 23.5 | 7½ | 950 | 2100 |
| normal sulfur | 1.0 | 21.7 | 7½ | 1050 | 2125 | 23.1 | 7½ | 1075 | 2175 |

*See our complete listing in Chemical Materials Catalog*

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Laboratory-tested Factice, a vulcanized vegetable oil is available in three main grades: "WHITE", "BROWN", and "AMBEREX". The type of Factice should be chosen for a specific job as a certain polymer is selected for meeting definite specifications in the finished item.

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Our well staffed laboratory will endeavor to answer your questions, as well as run laboratory samples on your suggested formulations. All formulas will be held in strict confidence.

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**Stamford, Conn.**


# technical books

## BOOK REVIEWS

**"Organic Chemistry of Bivalent Sulfur."** Volume II. E. Emmet Reid, Professor of Chemistry, Emeritus, Johns Hopkins University. Cloth cover, 5½ by 8½ inches, 476 pages. Chemical Publishing Co., Inc., New York. 1960. Price $20.00.

Volume II of this comprehensive five-volume survey of bivalent sulfur compounds by Professor Reid continues in the format and style of Volume I, which was reviewed in this column for May, 1959. The completed series will bring together information on sulfur compounds and their reactions in a form which will be unmatched for both completeness and convenience of use.

The seven chapters of the present volume are: 1. Occurrences and Preparation of Sulfides. 2. Reactions of Sulfides. 3. Physical Properties of Sulfides. 4. Hydroxy- and Halo-Sulfides. 5. Mustard Gas. 6. Sulfides Containing Other Substituents. 7. Physical Properties of Some Substituted Sulfides. The literature references for the first three chapters, which extend through 1954, are grouped together at the end of Chapter 3 to avoid repetition. There is a similar pooling of references for the last four chapters. The references total about 3,000 for the whole book and appear to include the "Chemical Abstracts" citation wherever available. Chapter 3 lists physical properties of several hundred compounds; Chapter 7 describes nearly 2,000. With each physical property is given the reference to the original literature. The 26-page index uses the inverted nomenclature of "Chemical Abstracts," thereby listing chemically related compounds together.

An outstanding feature of this series is its easy readability. This results from a refreshingly straightforward style of writing and from liberal use of chemical equations to illustrate the text. The critical comments in the text are from the viewpoint of a classical organic chemist; very little is said of reaction mechanisms.

The present rate of publication in this series, about one volume per year, means that when the series is completed even the latest literature references will be nearly ten years old. This fact is regrettable, but probably inevitable, and will not detract from the prominent position these books will hold in the literature of the subject.

DOUGLAS I. RELYEA

**"Tables for Identification of Organic Compounds."** The Chemical Rubber Co., Cleveland, O.

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* A partial listing of pigments from GDC. For further information contact your local GDC Technical Service Representative.

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## technical books

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This new reference volume lists in tabular form more than 30,000 derivatives of 4,380 parent compounds, arranged in 17 classes. All derivative data are uniformly arranged according to melting point, crystal color, and the solvent from which crystallized. Organic classifications include alcohols, aldehydes, alkly and aryl halides, amines, amino acids, aromatic hydrocarbons, carbohydrates, carboxylic acid anhydrides, carboxylic acid halides, carboxylic acids, ethers, ketones, nitriles, nitro compounds, phenols, quinones, and sulfonic acids.

Included are tables on miscibility of organic solvent pairs, surface tension of various liquids, emergent stem correction for liquid-in-glass thermometers, correction of boiling points to standard pressure, molecular depression of the freezing point, period chart of the elements, and atomic weights.

## NEW PUBLICATIONS

**"Philblack in Natural and Synthetic Rubbers."** Rubber chemicals division, Phillips Chemical Co., Akron, O. 56 pages. This booklet describes production of Philblack oil furnace blacks and describes physical and chemical properties and applications of the company's carbon blacks, and properties of cold Philprene SBR, oil-extended cold Philprene SBR, natural rubber, butyl, neoprene, and nitrile with three different loadings of Phillips blacks.

**"Eastman Chemical Products, Inc."** Eastman Chemical Products, subsidiary of Eastman Kodak Corp., Kingsport, Tenn. 6 pages. The bulletin lists Eastman chemicals of various types.

**"Fuels and Lubricants Services."** Foster D. Snell, Inc., New York, N. Y. 4 pages. This booklet describes activities of the fuels and lubricants section of the firm of chemical consultants and chemical engineers, with examples of routine tests and fees.

**"Current Trends in Compounding Synpols for Tread Rubber."** Synpol Application Bulletin #1. Texas-U. S. Chemical Co., New York, N. Y. 10 pages. This bulletin discusses a number of compounds for tread rubber and their physical characteristics, using Synpol masterbatches.

**"Trimene Base, a Rubber Accelerator and Latex Foam Stabilizer."** Naugatuck Chemical Division, United States Rubber Co. 4 pages. This bulletin describes the use of Trimene Base, a reaction product of ethyl chloride, formaldehyde, and ammonia, in stabilizing latex foam and in air curing neoprene cement, molded rubber goods, and other products. Properties and typical formulations are listed.

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| HIGH STYRENE SBR-1507/MB 50-50 | 85. | | |
| POLYMEL DX-40 | 20 | 30 | 40 |
| POLYMEL ACTISIL | 1.5 | 1.5 | 1.5 |
| ZEOLEX 23 | 60 | | |
| ZINC OXIDE | 5 | | |
| SANTOCURE | 2. | | |
| L-60 | 1. | | |
| D.O.T.G. | 0.5 | | |
| STEARIC ACID | 2. | | |
| SULPHUR | 2.5 | | |
| TOTALS | 242.0 | 252.0 | 262.0 |

## COMPOUNDS SHOWN

MIXED ON LABORATORY MILL WITH 6x12 INCH ROLLS. MOONEY SCORCHES @ 250° F. SMALL ROTOR.

| COMP. | Δ5 | Δ30 |
|---|---|---|
| A | 24 MIN. | 27 MIN. |
| B | 28 MIN. | 32 MIN. |
| C | 36 MIN. | 39 MIN. |

ACCELERATION HELD CONSTANT TO ILLUSTRATE SLIGHT RETARDATION OF POLYMEL DX-40.

| CURE: MIN. @ 320° F. | 3 | | | 6 | | | 9 | | | 12 | | | 15 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A | B | C | A | B | C | A | B | C | A | B | C | A | B | C |
| SHORE HDNS. | 90-88 | 90-89 | 89-87 | 91-90 | 91-90 | 90-89 | 91-90 | 91-90 | 90-89 | 91-90 | 91-90 | 90-89 | 91-90 | 91-90 | 90-89 |
| M-100 | 676 | 649 | 639 | 694 | 652 | 613 | 660 | 621 | 598 | 672 | 631 | 596 | 679 | 604 | 588 |
| M-200 | 913 | 838 | 819 | 934 | 857 | 797 | 886 | 828 | 787 | 899 | 825 | 773 | 899 | 794 | 774 |
| M-300 | 1172 | 1061 | 1020 | 1185 | 1023 | 987 | 1131 | 1019 | 977 | 1133 | 1026 | 964 | 1128 | 995 | 970 |
| M-400 | | | 1250 | | 1338 | 1235 | | 1291 | 1198 | 1420 | 1263 | 1192 | | 1239 | 1180 |
| TENSILE | 1221 | 1172 | 1356 | 1338 | 1338 | 1346 | 1248 | 1340 | 1346 | 1430 | 1340 | 1290 | 1242 | 1280 | 1340 |
| % ELONGATION | 320 | 350 | 430 | 350 | 400 | 410 | 360 | 408 | 427 | 405 | 415 | 420 | 340 | 415 | 435 |
| % PERMANENT SET | 47½ | 55 | 75 | 60 | 62½ | 70 | 47½ | 62½ | 70 | 62½ | 60 | 70 | 55 | 60 | 70 |
| ROSS FLEX 'A' CMPD 0.6 @ 43M; 0.9 @ 91M 'B' CMPD. 0.6 @ 43 M.; 0.9 @ 84 M 'C' CMPD. 0.6 @ 66M; 0.9 @ 120M. | | | | | | | | | | | | | | | |
| AGED TESTS (24 HRS. @ 100° C. AIR OVEN) | | | | | | | | | | | | | | | |
| SHORE HDNS. | 92-91 | 92-91 | 90-89 | 92-91 | 92-91 | 90-89 | 92-91 | 92-91 | 90-89 | 92-91 | 92-91 | 90-89 | 92-91 | 92-91 | 90-89 |
| M-100 | 825 | 831 | 733 | 809 | 774 | 671 | 730 | 724 | 625 | 732 | 726 | 622 | 706 | 686 | 606 |
| M-200 | 1103 | 1058 | 948 | 1063 | 1010 | 879 | 969 | 933 | 814 | 964 | 944 | 814 | 929 | 896 | 798 |
| M-300 | | | 1168 | | | 1095 | 1218 | 1140 | 1009 | 1174 | 1170 | 1019 | 1150 | 1094 | 981 |
| TENSILE | 1202 | 1230 | 1294 | 1304 | 1240 | 1286 | 1262 | 1140 | 1176 | 1330 | 1216 | 1219 | 1150 | 1150 | 1168 |
| % ELONGATION | 235 | 247 | 340 | 280 | 260 | 350 | 320 | 300 | 357 | 320 | 320 | 383 | 300 | 315 | 370 |
| % PERMANENT SET | 30 | 30 | 57½ | 45 | 35 | 60 | 50 | 37½ | 55 | 55 | 37½ | 62½ | 35 | 35 | 55 |
| ROSS FLEX | 'A' CMPD. 0.6 @ 28M; 0.9 @ 45M | | | | | | | | | FLEX SAMPLES CURED | | | | | |
| | 'B' CMPD. 0.6 @ 28M; 0.9 @ 35M | | | | | | | | | 10 @ 320°F IN 12 IRON | | | | | |
| | 'C' CMPD. 0.6 @ 52M; 0.9 @ 99M. | | | | | | | | | MOULD | | | | | |

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## technical books

**"Silicone Rubber Insulation for Wire and Cable."** Dow Corning Corp., Midland, Mich. 6 pages. This booklet outlines, with tables, graphs, and photographs, the properties of silicone rubber, including heat stability, stable electrical properties, ozone resistance, low-temperature flexibility, weather and storage stability, and fire and radiation resistance, which make it useful for insulation. Typical applications are described.

**"Hycar Rubber and Latex."** Hycar Technical Newsletter, August, 1960. B. F. Goodrich Chemical Co., Cleveland, O. 12 pages. This issue covers Ansul Ether 161, a new tackifier for Hycar; Synthetics L-1, a low-temperature plasticizer; plasticizers for Hycar 4021; aged low-temperature properties of plasticized Hycar 1042; and resistance of Hycar polymers to stiffening at low temperatures.

**"How to Proceed Under the Food Additives Amendment."** Manufacturing Chemists' Association, Inc., Washington, D. C. 12 pages. 50c each. This booklet is the first published section of a seven-part manual on food additives. It explains, in a question-and-answer format, how to determine whether a substance should be classified as a food additive, and procedures for filing petitions for approval, filing objections to regulations, and filing petitions for the U. S. Circuit Court of Appeals in order to obtain an order permitting use of the additive.

**"Coordinated Materials Handling, the New Frontier for Savings."** Catalog GC-1 Rapids-Standard Co., Grand Rapids, Mich. 42 pages. This catalog describes the different models of Rapistan conveyors, casters, wheels, hand trucks, and storage racks, explaining the uses of each with case histories for each type. Also included is a section on principles of a coordinated materials handling system, including controlled movement, conveyorized accumulation, mechanical transfer, and controls.

**"How to Bond Silicone Rubber."** Bulletin CDS-245, 4 pages. Silicone products department, General Electric Co., Waterford, N. Y. This publication discusses five categories of bonding problems, bonding cured silicone rubber to cured silicone rubber, bonding cured silicone rubber to metal, bonding cured silicone rubber to plastic, bonding uncured silicone rubber to cured silicone rubber, and bonding uncured silicone rubber to metal. Five tables are given on bond strengths of silicone rubber under different conditions.

**"The Story of Seiberling Rubber Company."** Seiberling Rubber Co., Akron, O. 8 pages. This booklet describes the products, plants, and history of the company, maps distribution of its products, and gives short biographical sketches of company officers.

*(Continued on page 56)*

## Ameripol Rubber plays undercover role for Spalding

At the core of each Spalding-made Major League baseball is a "cushioned cork center" covered with a quarter-inch layer of Ameripol Rubber.

More important than the amount of rubber used are the rigid requirements for constant quality. The center must be perfect in every way, with uniform resilience from ball to ball.

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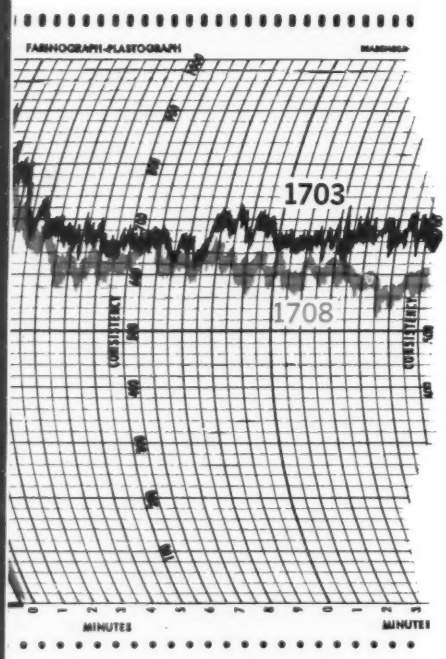
***If you are now using a low-oil SBR for molded and extruded goods you can cut costs by switching to Ameripol 1708 (37½ part oil). Tests show physical properties compare favorably, color excellent, processability improved.***




HIGHER-OIL
AMERIPOL
1708
EASIER TO PROCESS
Plastograph Comparison

One of the most widely used oil-extended SBR rubbers is 1703. Thus this polymer was selected as a "control" in laboratory tests to determine the advisability of switching to lower-cost Ameripol 1708, a higher-oil-level counterpart of 1703, in typical compounds. Comparative tests show that you can switch to Ameripol 1708 and obtain much the same physicals (improved in some respects). The tests were made in Goodrich-Gulf's Sales Service Laboratory on a typical low cost mat compound. The data here may help guide you to a substantial cost reduction. Ask your Goodrich-Gulf sales representative for complete information.

## RECIPES USED FOR COMPARISON OF 1708 AND 1703

The two polymers 1703 and 1708 were substituted for each other, part for part, in the typical low cost mat recipe given below. All other ingredients were held constant.

The compounded stocks were tested for Mooney scorch at 280°F and the cured compounds (5, 10 and 15 min. at 310°F for tensile, elongation, 100% and 200% modulus and hardness.

| | 1703 | 1708 |
|---|---|---|
| Polymer | 100 | 100 |
| Zinc Oxide | 5 | 5 |
| Stearic Acid | 1 | 1 |
| Sunproof Wax | 2 | 2 |
| Cumar MH 2½ | 10 | 10 |
| Circolite Oil | 10 | 10 |
| Clay | 150 | 150 |
| Whiting | 150 | 150 |
| Titanium Dioxide | 5 | 5 |
| Benzothiazyldisulfide | 2 | 2 |
| DPG | 1 | 1 |
| Sulfur | 4 | 4 |
| | 440 | 440 |

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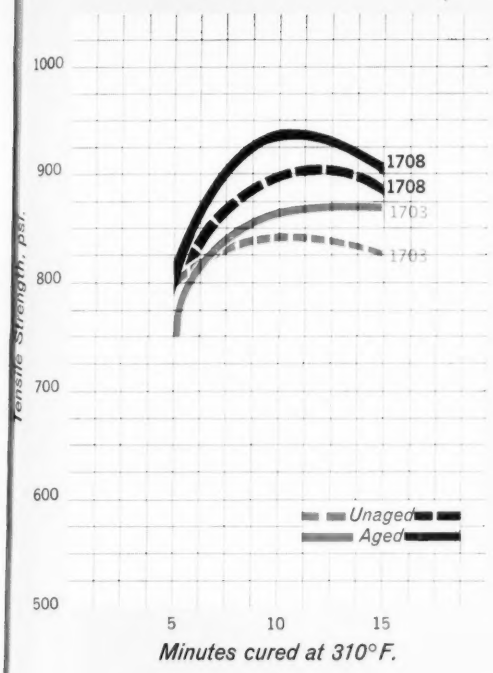
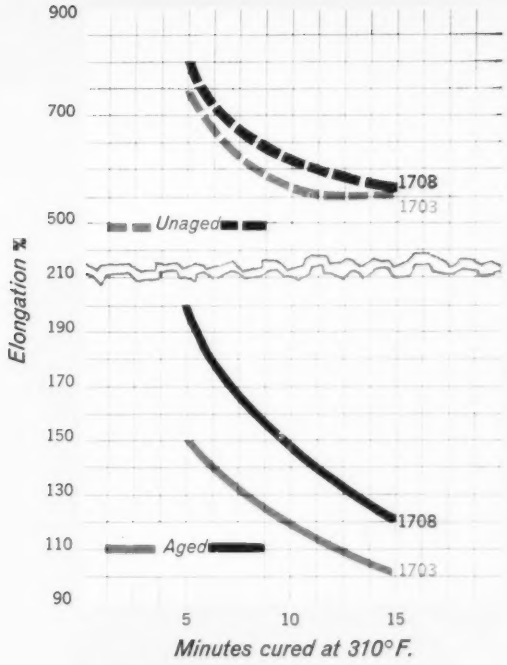


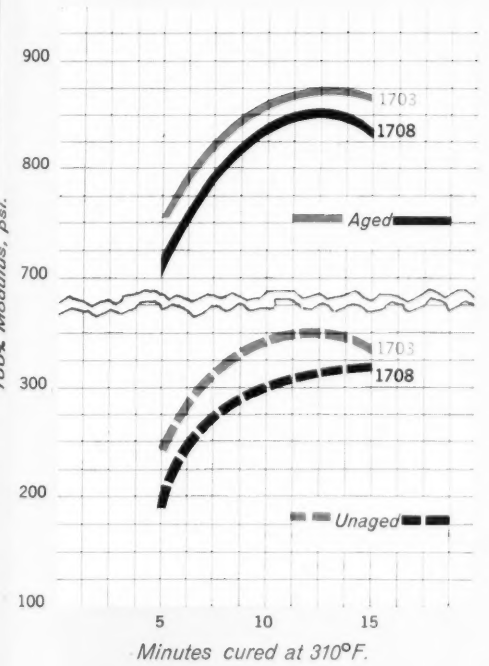

TENSILE STRENGTH



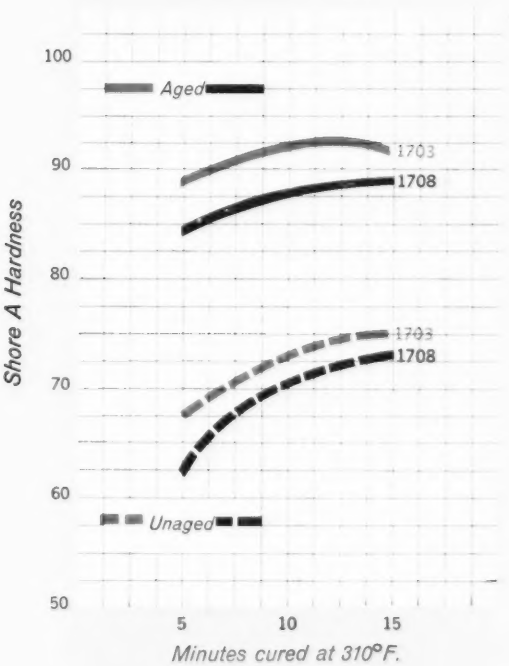

ELONGATION

## *Comparative tests prove performance of* AMERIPOL 1708

MODULUS




HARDNESS




**Goodrich-Gulf Chemicals, Inc.**

*Ameripol 1708*

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These samples of 1708 made by different manufacturers are taken from regular production runs. The superior light color of Ameripol 1708, which you can expect consistently, simplifies your color control and minimizes pigment additions. Again, Goodrich-Gulf quality works for your benefit.

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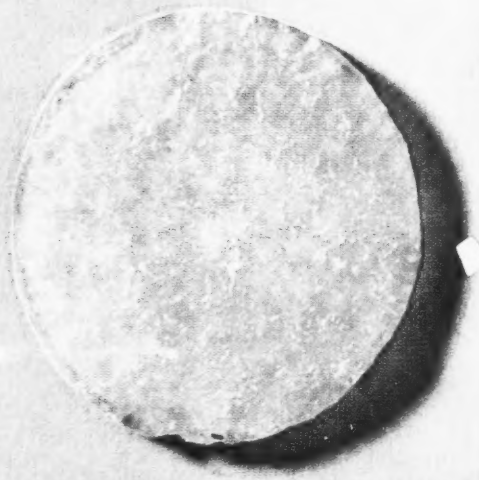
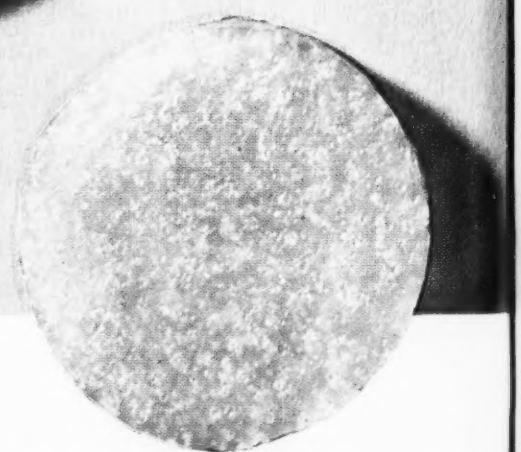


*Brand "C" 1708*



*Brand "D" 1708*

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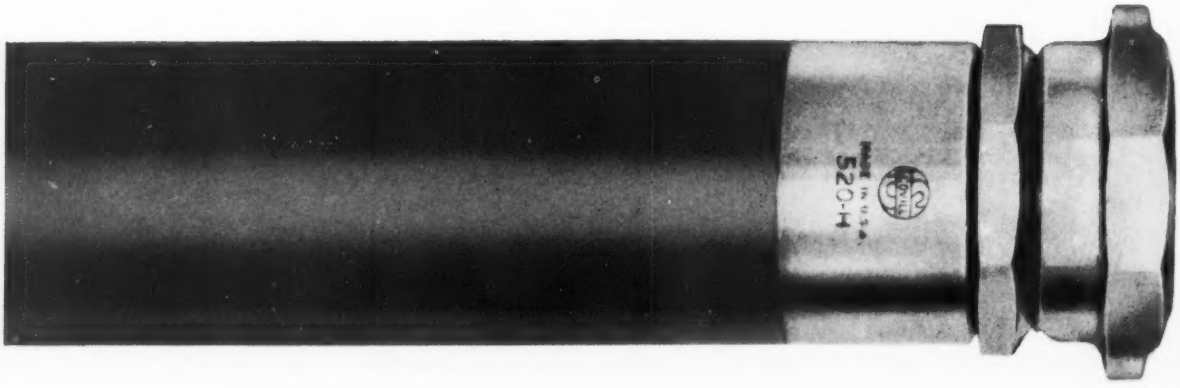

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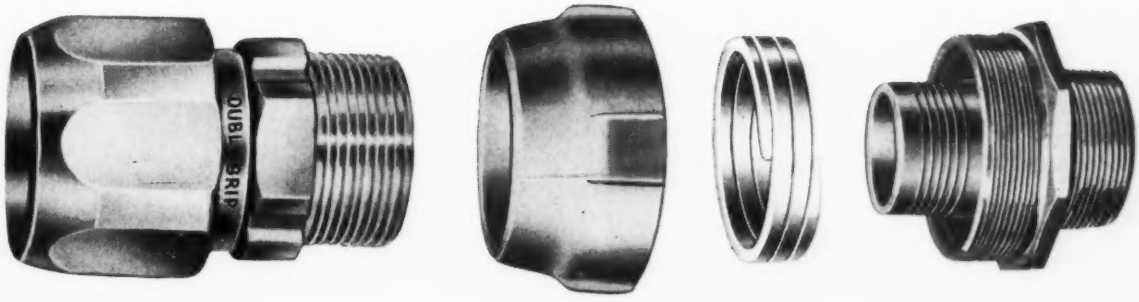


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## technical books

*(Continued from page 48)*

Publications of the chemical division, Goodyear Tire & Rubber Co., Akron, O.:

**"Chemical Division Product Directory."** 12 pages. This publication describes composition, properties, and applications of Goodyear SBR polymers, NBR polymers, vinyl reinforced nitrile polymers, reinforcing resins, antioxidants and antiozonants, and short-stopping agents, resin latices, SBR latices, nitrile latices and vinyl latex, adhesives, plastics and polyester resins.

**"Chemivic."** Tech Book Facts CV-1. 4 pages. This folder treats of Chemivic, a new polymer of nitrile rubber reinforced with vinyl resin. The product is said to combine high physical, oil and fuel resistance, and high resistance to water swell with resistance to ozone and weather, high abrasion resistance, and good color retention. Described are properties of Chemivic 400, a general-purpose polymer designed for molding, extruding, and calendering operations, and Chemivic 800, a specialty polymer developed for extrusion and calendering operations.

**"Plioflex 1507 in Closed-Cell Sponge Compounds."** Tech Book Facts PF-36. 4 pages. This pamphlet covers sponge compounds using Plioflex 1507, a cold, low Mooney SBR Polymer. Tables of properties are given.

**"Plioflex 1508 Pigmentation Study."** Tech Book Facts PF-37. 12 pages. This brochure describes compounding Plioflex 1508, a polymer developed for colored rubber goods, with seven black and five non-black pigments, showing the effect of the pigments on physical properties at each of four loading levels.

Publications of The British Rubber Producers' Research Association (now the Natural Rubber Producers' Research Association), Welwyn Garden City, Herts., England:

**"*Cis-Trans* Isomerization in Polyisoprenes. Part V."** By J. I. Cunneen, G. M. C. Higgins, W. F. Watson. No. 336. 13 pages. This publication treats of isomerization of natural rubber, guttapercha, Squalene, *cis-* and *trans*-3-methylpent-2-ene, and *cis*-polybutadiene.

**"The Wear of Slipping Wheels."** By A. Schallamach and D. M. Turner. No. 338. 25 pages. This article compares the simple theory of hindered rolling with experimental evidence on the wear of slipping wheels and concludes resilience is one of the most important factors governing the wear of slipping wheels, under certain conditions completely overshadowing differences in abrasion resistance.

**"Formation of Graft Polymers by Gamma Irradiation of Natural Rubber Latex and Methyl Methacrylate."** By E. G. Cockbain, T. D. Pendle, D. T. Turner. No. 339. 8 pages. This booklet covers formation of graft polymers by gamma irradiation and compares properties of resulting latices with those of similar latices in which graft polymerization was initiated by redox catalysts.

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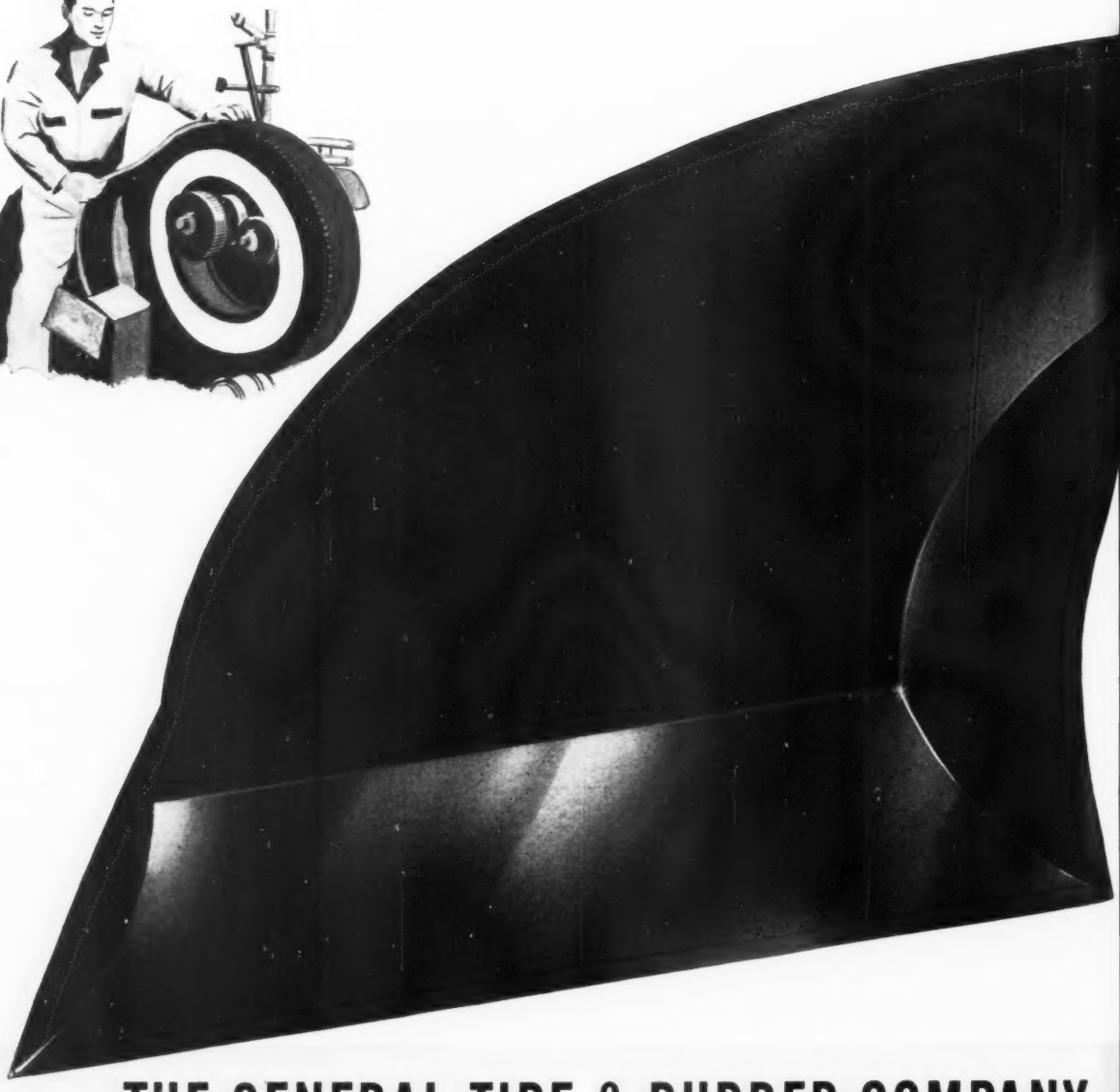

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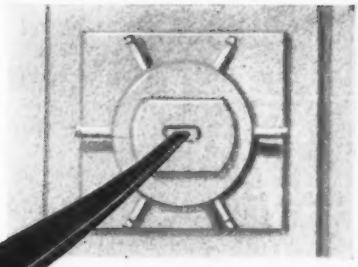

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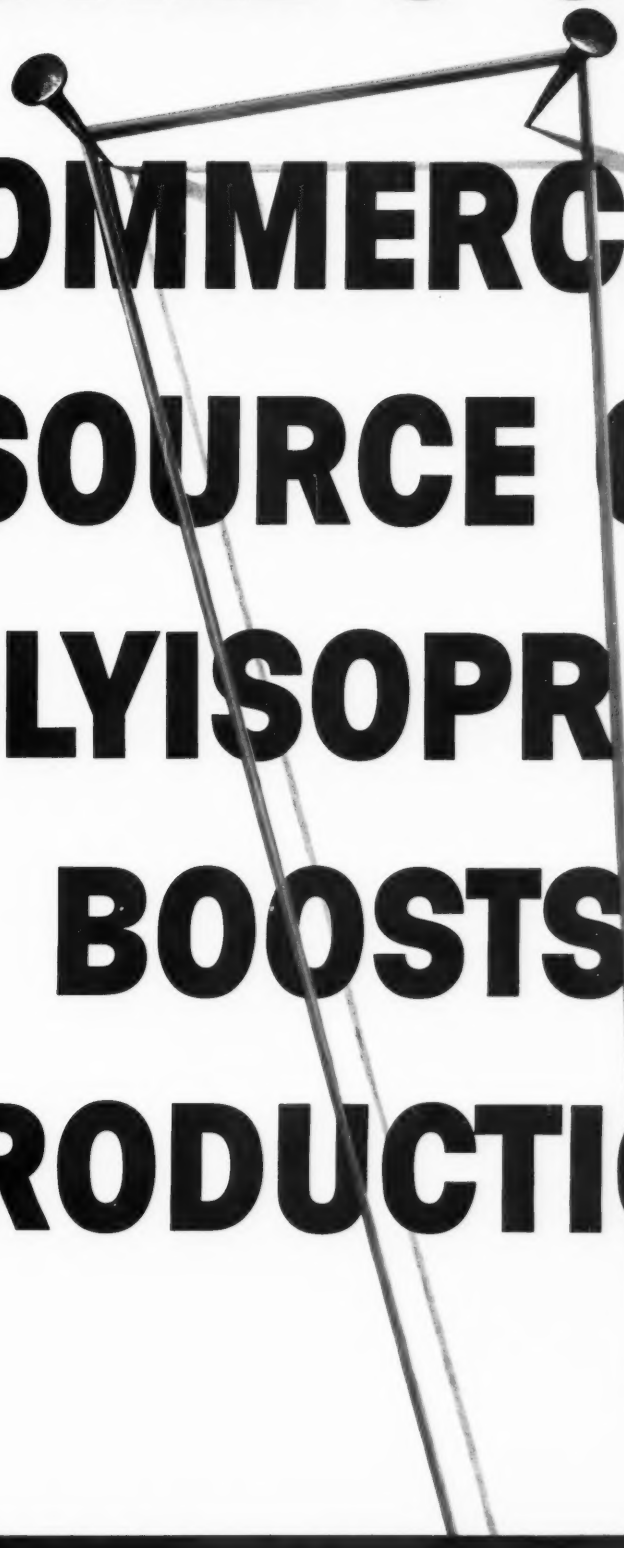

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# SHELL ISOPRENE RUBBER

# facilities now on stream

Since the first commercial shipment of Shell Isoprene Rubber twenty months ago, more than 3,000,000 pounds have been used by customers for evaluation in a wide variety of products.

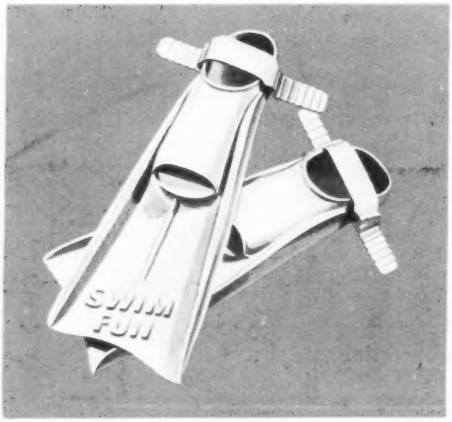
Today the expanded facilities at Torrance, California can supply more than 3,000,000 lb. of Shell Isoprene Rubber *per month.* And ground will soon be broken for a new plant of twice this capacity in the Midwest.

MORE →

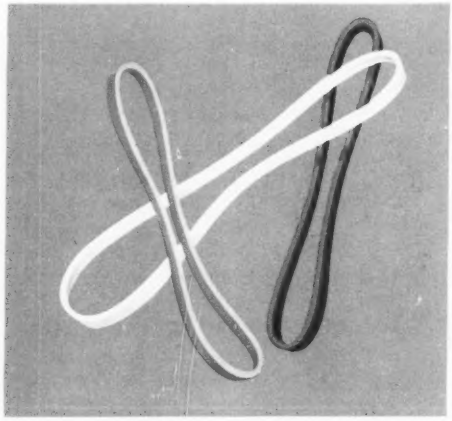
PULL DOWN

# Let your Shell Technical Salesman show you how to take advantage of the outstanding properties of

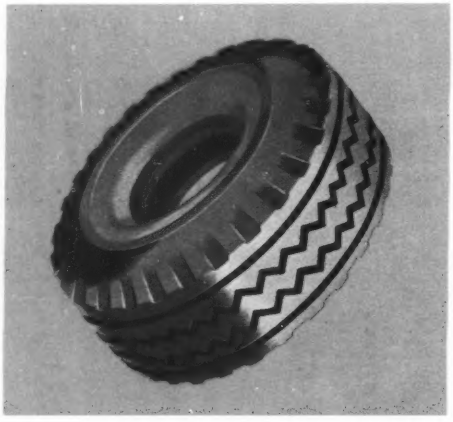
# SHELL ISOPRENE RUBBER




**IN MOLDED PRODUCTS** . . . superior mold flow . . . improving detail, reducing rejects.



**IN GUM STOCKS** . . . light color, uniformity . . . especially important in light- and bright-colored products.



**IN HEAVY-DUTY TIRES** . . . low heat build-up, high resiliency and good mold flow . . . reducing blemishes and rejects.

**IN PROOFED GOODS** . . . flexibility. uniformity, excellent mold flow and high purity.

For more information about Shell Isoprene Rubber or any of Shell's general purpose SBR polymers and latices, call your nearest Shell Chemical office.

SHELL

## SHELL CHEMICAL COMPANY

SYNTHETIC RUBBER DIVISION • P.O. BOX 216, TORRANCE, CALIFORNIA

5230 Clark Street
Lakewood, California
SPruce 3-4997

110 West 51st Street
New York 20, New York
JUdson 6-5060

750 Union Commerce Bldg.
Cleveland 14, Ohio
TOwer 1-8096

# HOW SULFASAN R ANSWERS YOUR CURING NEEDS IN NONBLOOMING, SCORCH-FREE, HEAT-RESISTANT COMPOUNDS OF SBR AND NATURAL RUBBER

Results with scores of different stocks compounded with SULFASAN R, powerful organic-type vulcanizing agent, all show increased heat resistance, greatly reduced scorch . . . and *no bloom* even after months of aging.

Economical SULFASAN R frequently trims costs, too . . . substantially reduces the total amount of curing agents required. About 1% of SULFASAN R on the rubber plus a small amount of THIURAD (tetramethylthiuram disulfide) achieves good results with most SBR and natural compounds.

Without SULFASAN R—*Stock Blooms Readily*

With SULFASAN R—*No Bloom at All*

**SPECIFICATION:** Withstand 70 hours @ 250° F. and 24 hours @ 325° F. in air oven without cracking when flexed 180°

| **COMPOUNDS** | **A** | **B** | **C** |
|---|---|---|---|
| SBR 1500 | 100 | 100 | 100 |
| Black | 75 | 75 | 75 |
| Zinc Oxide | 5 | 5 | 5 |
| Stearic Acid | 1 | 1 | 1 |
| Santoflex 75 | 1 | 1 | 1 |
| Flectol H | 2 | 2 | 2 |
| Santocure | 2 | 2 | 2 |
| THIURAD | 3.5 | 1.25 | 1.25 |
| SULFASAN R | —— | 1.25 | 0.75 |
| CURING AGENT COST | $3.99 | $3.36 | $2.59 |
| **TYPICAL RESULTS** | | | |
| Mooney Scorch (Large Rotor @ 250° F.) | | | |
| Minutes for 10-point rise | 8 | 11½ | 13 |
| **Unaged** | | | |
| Tensile, psi | 1880 | 2130 | 2070 |
| Elongation, % | 480 | 440 | 515 |
| Hardness | 60 | 60 | 59 |
| **Aged 70 Hours @ 250° F.** | | | |
| Tensile, psi | 2100 | 2260 | 2210 |
| Elongation, % | 260 | 235 | 290 |
| Hardness | 69 | 69 | 68 |
| **BLOOM** | Immediately | None in 9 months | None in 9 months |

SULFASAN R gives excellent aging at reduced cost . . . won't stain or discolor white rubbers. SULFASAN R disperses readily. Works well for butyl and Buna-N as well as SBR and natural rubbers . . . especially when used with SANTOCURE and other sulfenamide accelerators.

For further information about unique SULFASAN R, or help with a compounding project, write or phone, today.

Monsanto®

**MONSANTO CHEMICAL COMPANY**
**Rubber Chemicals Dept.**
**Akron 11, Ohio**
**HEmlock 4-1921**

*SANTOFLEX, SANTOCURE, FLECTOL, THIURAD, SULFASAN: T. M.'s, Monsanto Chemical Company*

# QUALITY PRODUCTION CONTROL PROTECTS

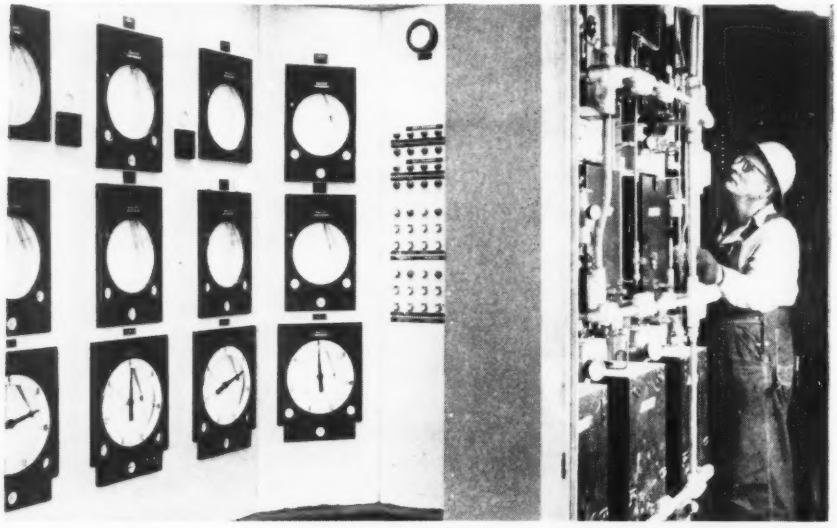
# YOUR **CARBON BLACK** DOLLAR

## AT

## WITCO-CONTINENTAL

**At Witco-Continental, experienced personnel control carbon black production with modern instrumentation techniques and complete laboratory testing. As a result, Witco's fully automated controls yield a continuously uniform product.**

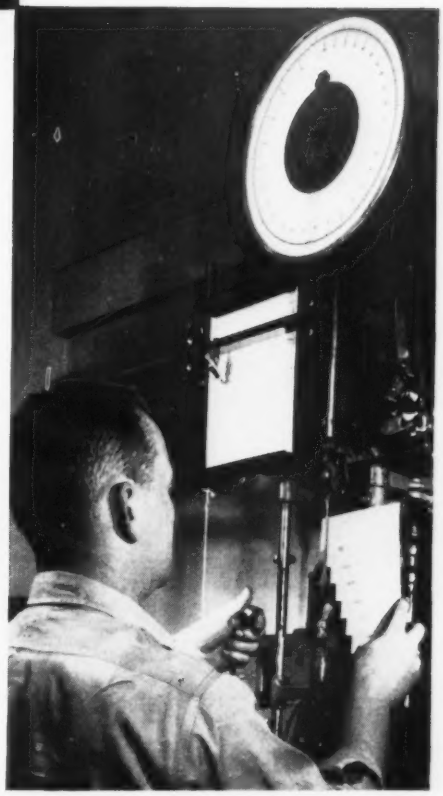
**Furthermore, because Witco laboratories are located at plant sites, immediate testing results in faster production schedules. So, when you purchase carbon blacks, be sure you insist on highest quality—insist on WITCO-CONTINENTAL.**



Centralized instrument panels, part of the fully instrumented production controls in use at Witco-Continental, record the continuous operating conditions in the plant. Temperature control points, recorders and automatic alarm systems evaluate and control conditions to assure a constantly uniform product. Start-up and shutdown for cleaning operations are push-button procedures.

Feed stock meters critically control hydrocarbon feed... play a vital part in the achievement of uniformity of black properties. Here, an operator conducts a routine inspection.

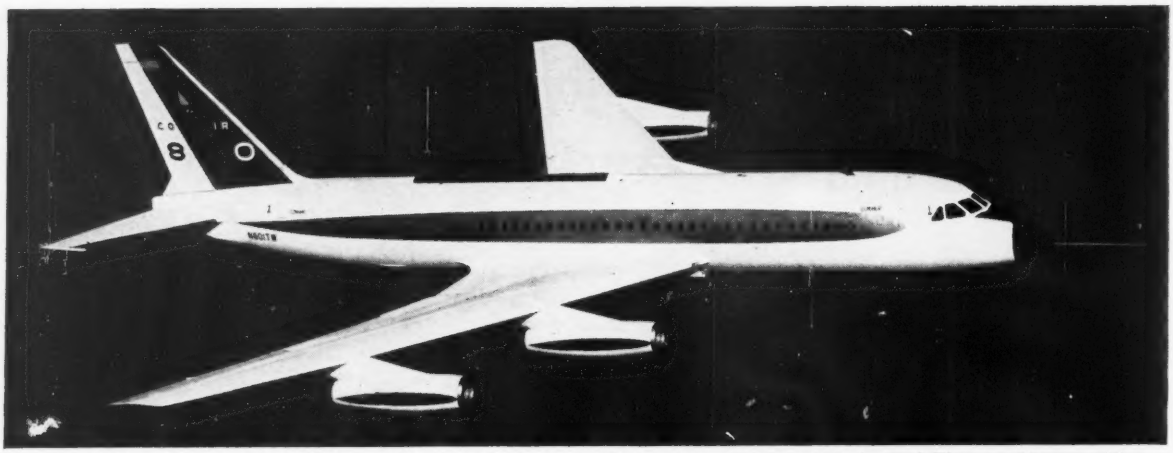
As a final check on production control, physical testing of the black itself and testing in rubber are performed by highly skilled rubber technicians. Witco's modern plant site laboratories make possible on-the-spot testing geared to the continuous production of carbon black that meets customer requirements. Test results are fast. There is no lag between production and evaluation. Production control is constant and uniform.



**WITCO CHEMICAL COMPANY, Inc.**
**CONTINENTAL CARBON COMPANY**

122 East 42nd Street, New York 17, N. Y.

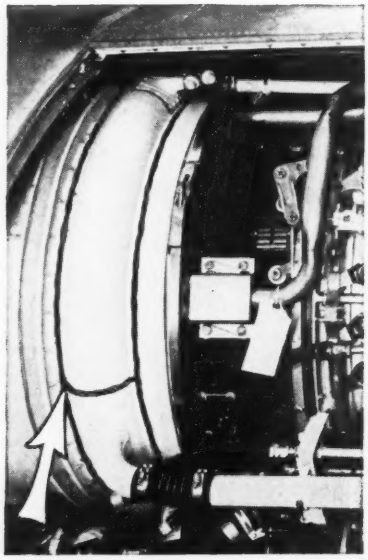
Sales Offices in Chicago • Quincy-Boston • Akron • Atlanta • Houston • Los Angeles • San Francisco • Toronto and Montreal, Canada (Soden Chemicals Division) • London and Manchester, England • Glasgow, Scotland • Rotterdam, Holland



**Flex-support door seal** designed by Convair is typical of advance design features of the 880. General Electric silicone rubber—with its outstanding resistance to temperatures, ozone and aging—is used extensively on the General Dynamics Convair 880.

# General Electric silicone rubbers meet rigorous requirements of new Convair 880

**Unique silicone rubber door seal** incorporating spring steel flex-support, a fail safe feature that eliminates the danger of seal collapse. General Electric SE-555, with twice the strength of regular silicone rubber, easily withstands flexing of integrally molded steel support. Over 600 wiping action and pressure cycling tests prove seal will meet all operational requirements.



**G-E RTV high-temperature sealant** is used extensively in pylon and pod assemblies which hold G-E CJ805-3 jet engines. Liquid RTV (room temperature vulcanizing) silicone rubber is easily applied and cures without heat. RTV has excellent bond strength, good physical properties, plus resistance to temperature extremes (600°F and above), ozone, weathering, moisture, aircraft fuels and solvents.

**Now available: New G-E Silicone Rubber Selector.** This guide will help you quickly select the right silicone rubber to best meet your application requirements. In it you will find important data on applications, primary classes, typical properties and specifications. Tells how to specify the grade you want by AMS, ASTM or military specifications. Write for your free copy.

**GENERAL ELECTRIC**

Section 11911, Silicone Products Department, Waterford, N. Y.

# your compounding dollars go further with

# car-bel-rez c®

## Maintains Quality and Cuts Costs in SBR, Neoprene and NBR Rubber

**CAR-BEL-REZ C** is a thermoplastic, oil-resistant resin which is polymerized to a relatively high molecular weight for optimum physical properties in elastomeric and plastic compositions. It disperses easily without high-temperature mixing.

CAR-BEL-REZ C is made by
THE CARTER BELL MFG. CO.

**SBR**

Compounded with equal parts of SBR, CAR-BEL-REZ C produces vulcanizates with excellent physical properties and improved oil and ozone resistance. These SBR stocks, even though they contain both resin and process oil, work easily on the mill without becoming soft and sticky. The "free sulphur" (polysulphide) reduces the accelerators needed in the recipe. SBR vulcanizates containing CAR-BEL-REZ C can be made to meet the basic requirements for oil-resistant rubber, type S, Class SC. The high reinforcing action of CAR-BEL-REZ C greatly improves the physical properties of non-black SBR stocks.

**NEOPRENE**

Up to 20 parts of CAR-BEL-REZ C added to neoprene stocks will not materially change the physical properties. The resin plasticizes neoprene, while giving good flex life, decreasing the tendency to stick to mill and calender rolls, and improving bin aging of raw stocks. The addition of 50 parts CAR-BEL-REZ C will produce superior ozone resistance.

**NBR**

Excellent physical properties can be obtained with the use of CAR-BEL-REZ C. Nitrile compounds can be extended without appreciably reducing the oil resistance.

FOR COMPLETE TECHNICAL AND APPLICATION DATA WRITE TO:

**HARWICK STANDARD CHEMICAL CO.**

60 SOUTH SEIBERLING STREET, AKRON 5, OHIO

| ALBERTVILLE, ALA. | BOSTON 16, MASS. | CHICAGO 25, ILLINOIS | GREENVILLE, S.C. | PICO RIVERA, CALIF. | TRENTON 9, N.J. |
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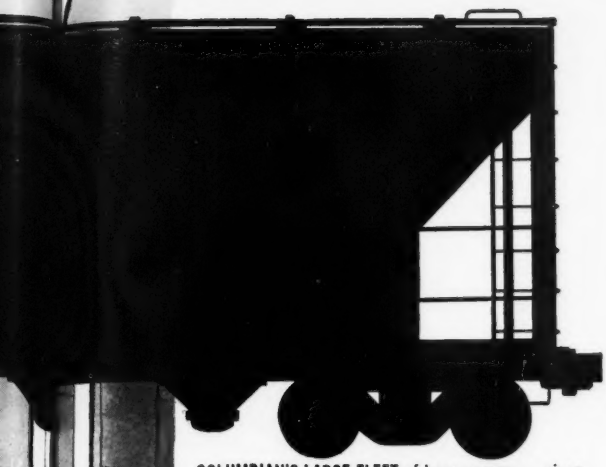
2355



**COLUMBIAN'S LARGE FLEET** of hopper cars . . . gives bulk users the utmost in shipping economy and service.

**COLUMBIAN** has developed many new money-saving ideas for shipping carbon blacks . . . providing product protection and convenience.

COLUMBIAN CARBON

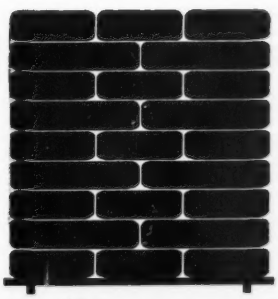
# COLUMBIAN...

## leader in packaging

## every step of the way!

The development of better packaging and shipping techniques for carbon blacks is a vital — and unceasing — activity at Columbian. Results? Easier handling, product protection, convenience. Columbian provides not only outstanding products . . . but gets them to you in the best way — for your use. Ask for details . . . now!

**COLUMBIAN CARBON COMPANY**
**380 Madison Avenue, New York 17, N. Y.**



**COLUMBIAN's** packaging program provides the constant research necessary for seeking out new and improved containers for carbon black.

**COLUMBIAN HAS A CARBON BLACK FOR EVERY NEED**

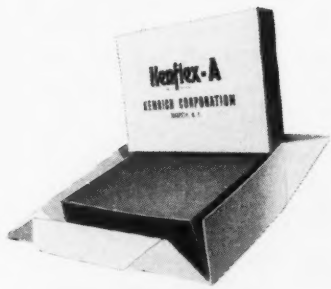
**STATEX® 160 SAF** Super Abrasion Furnace
**STATEX 125 ISAF** Intermediate Super Abrasion Furnace
**STATEX R HAF** High Abrasion Furnace
**STANDARD MICRONEX® MPC** Medium Processing Channel
**MICRONEX W6 EPC** Easy Processing Channel
**STATEX B FF** Fine Furnace
**STATEX M FEF** Fast Extruding Furnace
**STATEX 93 HMF** High Modulus Furnace
**STATEX G GPF** General Purpose Furnace
**FURNEX® SRF** Semi-Reinforcing Furnace

**And Now**
**NEOTEX 100**
**NEOTEX 130**
**NEOTEX 150**

# Kenflex REG. TRADE MARK ...the versatile aromatic resin for processing

**Liquid Resin**

Kenflex resins are available in 55 gallon standard steel drums for handling with mechanical equipment.




**Solid Resin**

Kenflex "A" and other solid resins are available in glassine lined cartons for easy handling. These cartons use no staples or tape. They are also packed in standard asphalt type drums.

## KENFLEX "A"

Makes news at the 1960 Fall ACS Rubber Meeting!

In "A Study of First-and Second-Order Transition in Neoprene" presented by E.I. DuPont de Nemours & Co., Elastomer Chemicals Division. **KENFLEX "A" again substantiated as an effective retarder of crystallization in Neoprene**

*Write for KENFLEX "A" Samples and Technical Data Today*

### KENFLEX® RESINS reduce your processing problems:

- Increase plasticity without weakening the final product.
- Kill nerve in Butyl, SBR and Neoprene.
- Speed flow in mold for thin-walled Neoprene and Nitrile articles.
- Improve mold release and improve gloss.
- Speed extrusion rates.
- Improve accelerator dispersion.
- Allow higher carbon black and clay loadings.

### KENFLEX® RESINS upgrade your product

- Improve electrical properties of Neoprene, Hycar and Vinyl Insulation.
- Increase ozone resistance and heat stability of Butyl, Neoprene and Nitrile compounds.
- Improve surface appearance of Neoprene molded compounds.
- Retard Neoprene crystallization.
- Improve electrical properties of other plasticizers and resins.

• *Samples of Kenflex available on request on your letterhead.*

# KENRICH PETROCHEMICALS, INC.

57-02 48th STREET, MASPETH 78, NEW YORK

Octa

# SOUND ENGINEERING

## . . .THROUGHOUT THE WORLD

Since 1940, a total of 74 predip and calendar lines for rayon and nylon tire cord fabric production have been designed and built by C. A. Litzler engineers for leading tire manufacturers throughout the world. In addition to these prime production installations located in 32 countries around the globe, 22 Compu-treaters — precision laboratory impregnation lines introduced in 1957—have been built for worldwide customers.

All of these production units are in profitable operation today, and a substantial number of them represent repeat orders based on outstanding performance of an initial unit or line.

Designed for clean, highly accurate and rugged performance, these Litzler units qualify, by actual report of the operating engineers, as requiring the lowest maintenance in the industry.

## C. A. LITZLER CO., INC.

*SOUND ENGINEERING FOR TOMORROW'S PRODUCTION*

**235 BROOKPARK RD. CLEVELAND 9, OHIO CABLE "CALITZ"**

**EXPORT REPRESENTATIVE: GILLESPIE & CO. OF N. Y., 96 WALL ST., NEW YORK 5, N. Y.**

**LICENSED FABRICATORS:** Benno Schilde Maschinenbau A. G. Bad Hersfeld, Germany; Soc. Alsacienne de Constructions Mecaniques Paris, France; Mather & Platt, Ltd. Manchester, England

# THERE'S TEXUS ALL AROUND

## *SYNPOL® 8201 outperforms . . . yet costs less . . . than "low cost" specialty rubbers in automotive applications*

SYNPOL 8201 is a highly oil-extended SBR polymer that *continues* to prove both its performance and its *cost* advantages over competitive specialty compounds in dozens of automotive applications which require superior ozone and weathering resistance.

Progressive manufacturers of automotive rubber products prefer SYNPOL 8201 because it permits them to meet SAE-ASTM specification R-515 at savings of *10 to 15% over specialty compounds which merely meet R-508!*

8201's superior tensile strength, great dimensional stability, excellent filler tolerance, efficient utilization of protective chemicals, superior coefficient of friction, and low modulus characteristics combine with its precise extrusion and molding characteristics to make such performance possible.

Ozone- and weather-resistant SYNPOL 8201 compounds are non-staining and non-discoloring; have excellent glass and metal gripping qualities, all of which are extremely important for automotive window molding. Compare its superior physicals *and* its lower ultimate cost and it's easy to see why it has become the standard of the industry.

For full technical information, write TEXUS, 9 Rockefeller Plaza, New York 20, N. Y. Or call JUdson 6-5220.

## COMPARE THESE SAE-ASTM TEST RESULTS

| | Competitive Specialty Compound (R-508 spec.) | SYNPOL 8201 Compound (R-515 spec.) |
|---|---|---|
| **Tensile, psi (min.)** | 650 | 1515 |
| **Elongation, % (min.)** | 430 | 525 |
| **Shore A Hardness** | 65 | 52 |
| **Weather Resistance, 90 days outdoors** | Cracks | No Cracks |
| **Torsional Modulus, psi** | 11,100 | 50,000 |
| **Dimensional Stability** | Poor | Excellent |
| **Cost/100 pieces (min. finishing operations)** | $79.81 | $70.52 (11.5% savings) |
| **Cost/100 pieces (max. finishing operations)** | $228.95 | $197.39 (13.5% savings) |

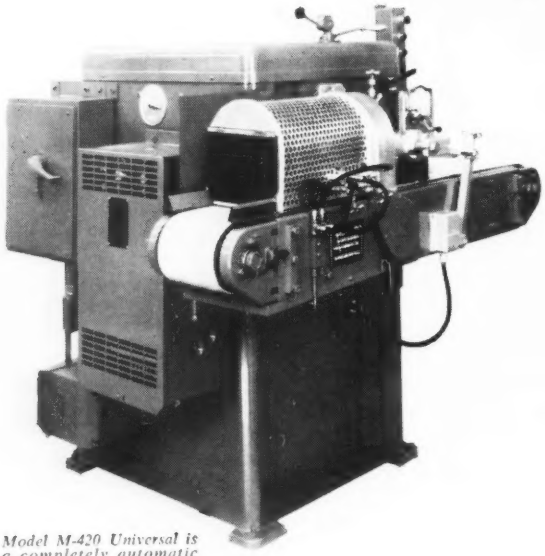
**TEXUS** *Pace Setter in Synthetic Rubber Technology*

**TEXAS-U. S. CHEMICAL COMPANY, 9 Rockefeller Plaza, New York 20, N. Y. JUdson 6-5220**

*Typical rubber part molded from preps cut automatically by Wink Cutter at Monarch Rubber Co., Hartsville, Ohio.*

# "Wink Cutter saves us 50 manhours a day"...

## Monarch Rubber Company automates cutting of mold preps; eliminates double handling; speeds operations



*Model M-420 Universal is a completely automatic machine for both continuous and intermittent cutting. Pays off on short or big runs. The built-in metering conveyor elements transport the uncut stock to the knives, precisely measure the length of cut and move the cut stock away from the blades. Wink actually measures while it cuts from four points simultaneously. It does not depend upon timing or synchronization with another unit or machine—does not cut against a dead element but against another live knife.*

*New—Large cutter handles up to 6-inch diameters. Write for information.*

"The Wink Cutter has really paid off for us in cutting mold preps", reports Monarch Rubber Company, producers of a wide range of molded rubber products. "By automatically cutting mold preps right at the extruder, at rates up to 1500 pieces a minute, we're saving 50 manhours a day." In this operation, the extruded material was formerly cut into long strips, transported to a guillotine cutter, unloaded, and cut at much slower rates.

*Accuracy* of the Wink Cutter also saves money for Monarch. The Wink unit cuts each piece within a fraction of an ounce. By holding weight of each piece so closely, flashing in the mold is reduced, minimizing waste material. "It's the most accurate machine we've run across", reports Monarch, "and this is important in big production runs."

Wink Cutters *can help you* reduce costs in cutting rubber, both raw and cured, plastics, impregnated fabrics, reinforced hose, natural and synthetic fibers, ceramics, candy ... even sticky or viscous materials. Write today for Bulletin W-100... it lists complete engineering information. Contact Motch & Merryweather Machinery Company, Wink Cutter Division, 1250 East 222nd Street, Cleveland 17, Ohio.

MOTCH AND MERRYWEATHER

**WINK CUTTER DIVISION**
1250 East 222nd Street • Cleveland 17, Ohio
*Represented in United Kingdom, Eire, Europe by*
**FRANCIS SHAW & COMPANY LTD. • MANCHESTER 11, ENGLAND**

# TIDE'S ROLLING IN

# SEAMAG*

## fmc's new Neoprene Magnesia

From plant after plant where compounders have tested Seamag extensively come enthusiastic reports of success. Consensus is that Seamag produces results equal to or better than any other magnesia . . . *and does it more economically.*

High activity, extremely fine particle size and high-bulk density give Seamag outstanding efficiency and superior working properties as an anti-scorch and curing agent. It mills more readily into the batch and produces uniform dispersion.

Made by a new, exclusive FMC process, backed by fully integrated production and inexhaustible raw material supply, Seamag is attractively priced and amply available to meet growing demand now and into the future.

***Samples and data on request***

*trademark

*Putting Ideas to Work*

FOOD MACHINERY AND CHEMICAL CORPORATION

**Mineral Products Division**

General Sales Offices:
161 E. 42nd STREET, NEW YORK 17

# Solve Your DISPERSION PROBLEMS With

# ST. JOE Surface-Treated ZINC OXIDES

St. Joe surface-treated zinc oxides are very stable in storage, because the coated particles are hydrophobic and do not absorb moisture and $CO_2$ from the air to form agglomerates. They disperse in a rubber mix rapidly and thoroughly, developing physical properties in vulcanized rubber comparable to standard Black Label No. 20, Green Label No. 42 and Green Label No. 42A3. For these reasons, St. Joe surface-treated zinc oxides are recommended for all uses in which unusual and difficult dispersion problems are encountered.

| Grade | Black Label 20-21 | Green Label 42-21 | Green Label 42A-21 |
|---|---|---|---|
| Ave. Particle Size $D_1$—Microns | .20 | .28 | .28 |
| $N_2$ Specific Surface—Sq. M/gram | 10.91 | 5.27 | 5.27 |
| Total S and $SO_3$ | .05 | .05 | .35 |
| Apparent Density—Lbs./cu. ft. | 25 | 45 | 45 |
| Curing Rate | Fast | Fast | Slow |

The above grades are also available in the form of Free-Flowing, Dustless Pellets having an apparent density of 60 pounds per cubic foot.

*For further information, write for St. Joe's Technical Data Booklet.*

## ST. JOSEPH LEAD CO.

250 Park Avenue
New York 17, N. Y.

Plant & Laboratory:
Monaca (Josephtown) Pa.

LEAD-FREE ST. JOE ZINC OXIDE

ZNO-187

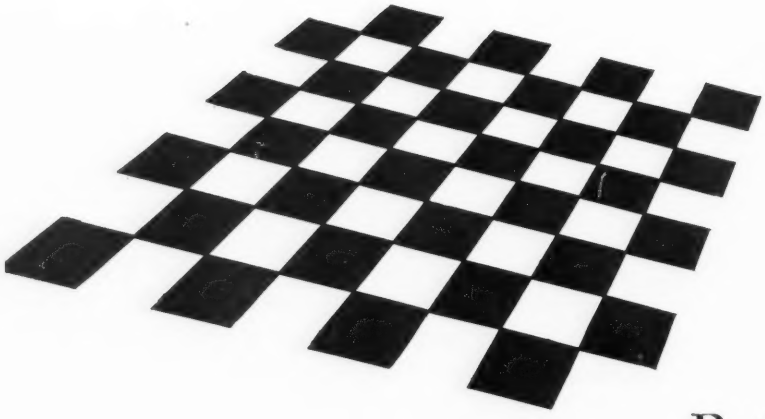
# Piccopale emulsions

**the perfect mixer.** Piccopale emulsions fortify and improve the important properties of latices, resin emulsions and other water-based systems. Available in a variety of grades, these emulsions are broadly compatible, water and alkali resistant, provide excellent adhesion and pigment binding, are low in cost and available in abundant supply.

*The trademark of quality*

**PENNSYLVANIA INDUSTRIAL CHEMICAL CORPORATION**
**CLAIRTON, PENNSYLVANIA**

**Distributed to the Rubber Industry by HARWICK STANDARD CHEMICAL CO., Akron 5, Ohio**



# Patient

To be patient is more than a virtue, it's a necessity in business, human relations and certainly in editing a business magazine. Without patience to see the right man, search for the facts, dig for the story and the patience to write it well, there is no service done to the industry or business the publication serves.

At Bill Brothers, too, patience is more than a virtue—it's a publishing philosophy and an editorial requirement.

BILL BROTHERS PUBLICATIONS Fast Food • Floor Covering Profits • Modern Tire Dealer • Plastics Technology
Premium Practice • Rubber World • Sales Management • Sales Meetings

# Will your products look old before they're sold?

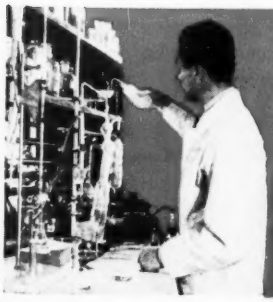
## not if you use VELSICOL X-37 Hydrocarbon Resin!

**VELSICOL'S X-37 RESIN** used in white or light colored rubber products maintains resistance to ultra violet discoloration. Recipes that contain X-37 keep their light, fresh, appealing colors. On the shelf, on display, and in use, they retain color character that appeals to consumers and keeps them coming back for more! X-37 also increases flex, and you can use it in shoe soles, household products, light colored flooring tile, and many other rubber compounds. Get the facts now, without cost or obligation!

**LOOK FOR THIS MAN**

*... your Velsicol representative who can help you make better products for less!*

**MAIL THIS COUPON TODAY FOR TECHNICAL INFORMATION AND TEST SAMPLES**



**VELSICOL**

330 E. Grand Ave., Chicago 11, Ill.

International Representative:
Velsicol International Corporation, C.A.
P. O. Box 1687 • Nassau, Bahamas, B.W.I.

RW-100

VELSICOL CHEMICAL CORPORATION
330 East Grand Avenue, Chicago 11, Illinois

☐ Please have a salesman call to discuss Velsicol X-37 resins.
☐ Please send a sample for pilot plant use.
☐ Please send technical literature.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

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Mildew-proofing *and* Flame-proofing Cotton Fabrics as per Government Specifications. *Write or Wire for Samples and Quotations.*

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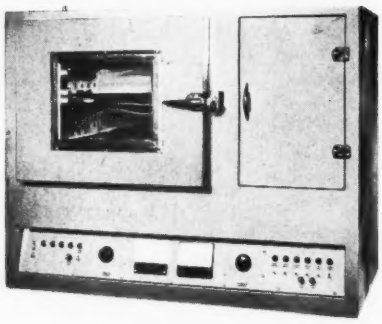

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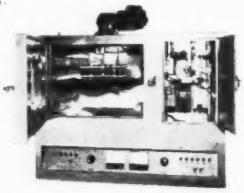

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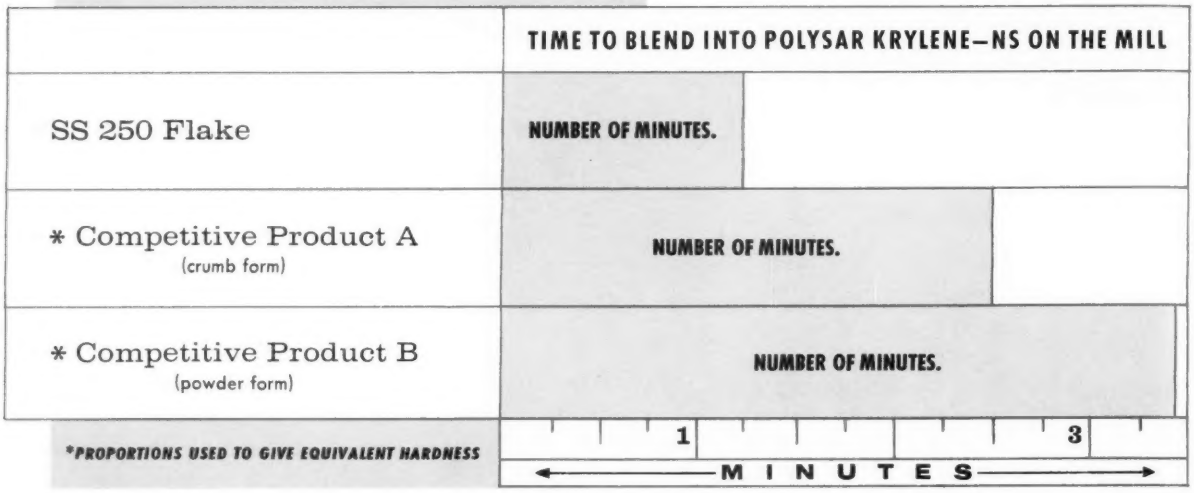


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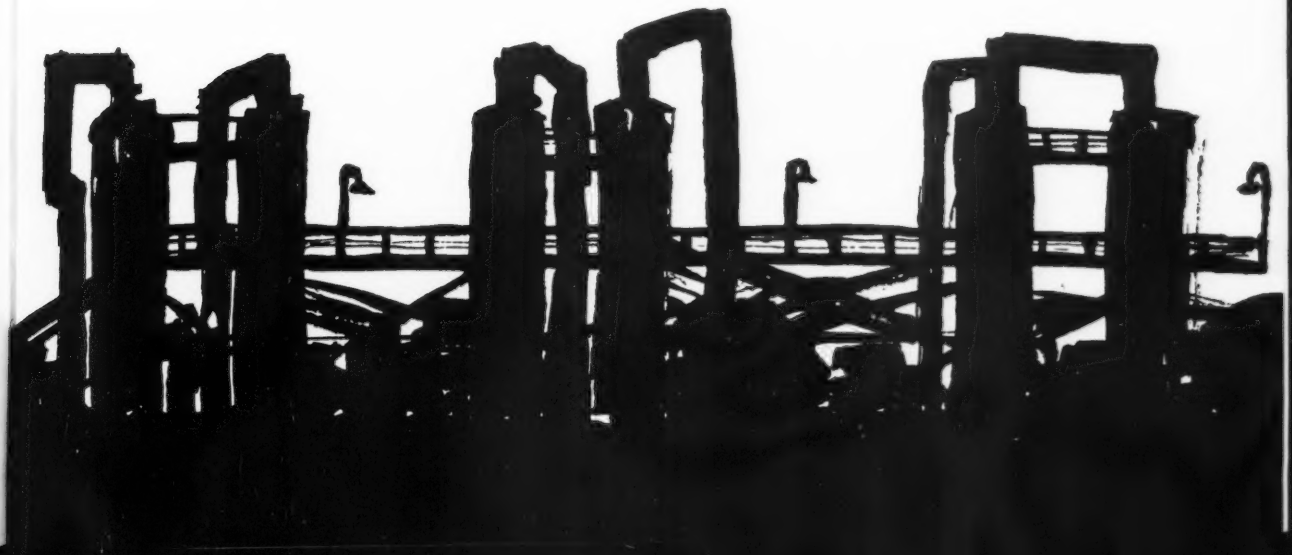

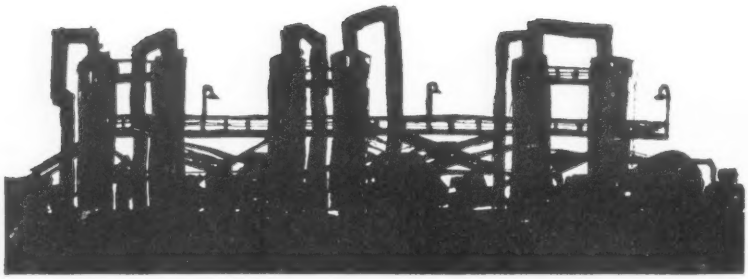

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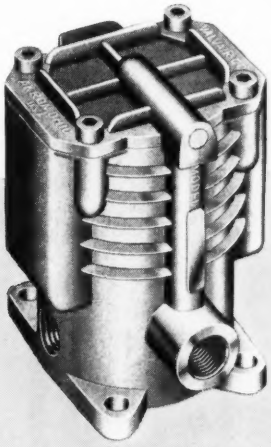

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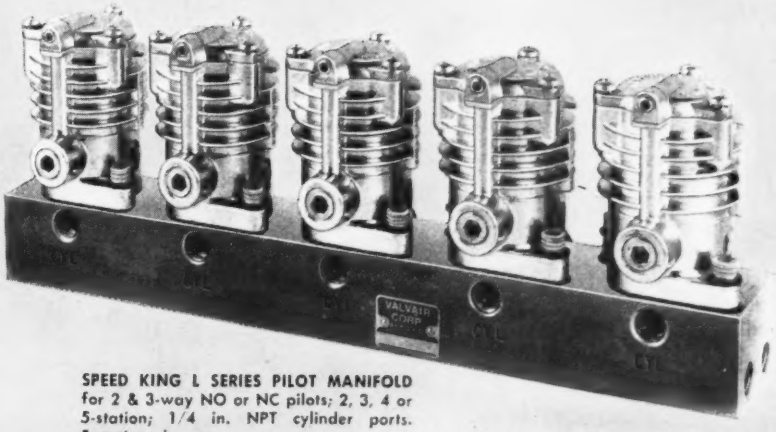

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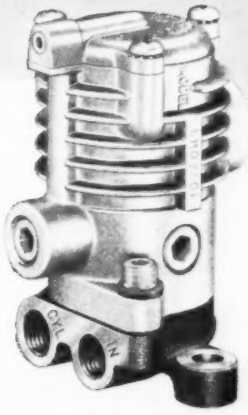

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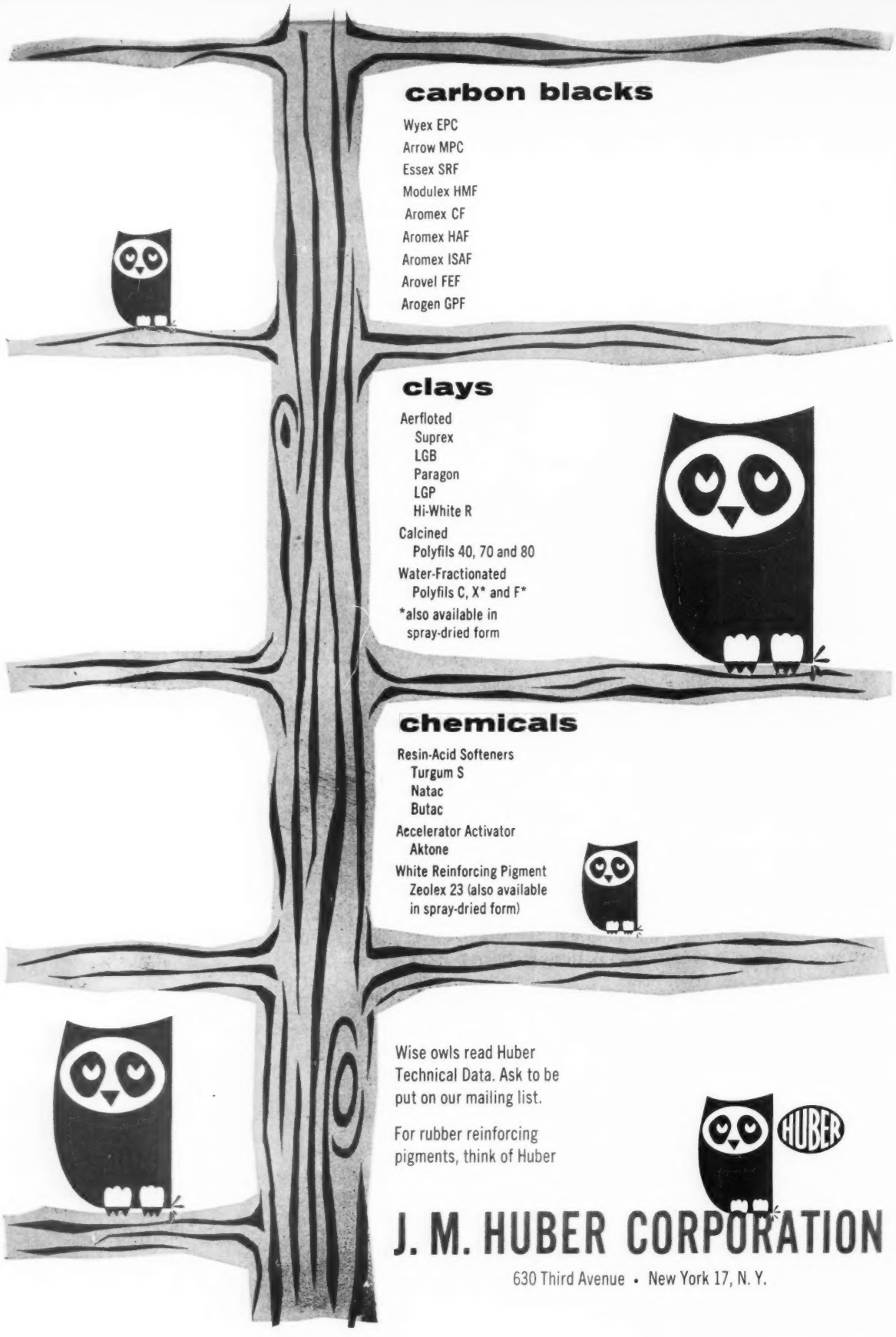

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## editorial

# Great Coordination in Rubber Technology A Present-Day Need?

Are the needs of the scientist, engineer, and technologist for education and information on rubber being adequately taken care of at the present time, or is further improvement necessary? Progress has been made in the last decade in providing courses in polymer science and in rubber technology in various universities and colleges and even outside the academic world. The rubber divisions of several scientific and technical organizations have contributed much new information on rubber at their meetings, but the speed with which this information becomes available in published form to those who need it often leaves something to be desired.

We wonder if a certain increased amount of cooperation among the academic world, the technical societies, and the industry on education and publication problems in rubber might not be desirable in view of the pressure of present-day demands for information and informed technical personnel?

In education, for example, there are a number of courses in rubber chemistry and technology given at various universities, but not all of these are credit courses. Until such time as the student can obtain full credit for such courses, he is less likely to learn about rubber from them. Also, greater prominence to information on rubber and elastomers should be included in courses which cover the broad area of what is now known as material science.

For the technical man employed in the rubber and related industries there are courses on rubber technology in those areas of the country where local rubber groups sponsored by the Division of Rubber Chemistry of the American Chemical Society are located. A selected group of lectures from these courses has been published by the Rubber Division in a book entitled, "Introduction to Rubber Technology," edited by Maurice Morton, of the University of Akron, thus making this information available to those not in a position to participate in the established credit or non-credit courses.

The current literature on rubber chemistry and technology is taxing the capacity of journals of the ACS, its Rubber Division, and the trade journals, but the literature on the engineering properties of rubber is less readily available while being sought after to an increasing degree. At one of its recent meetings the Molded and Extruded Subdivision of the Rubber Manufacturers Association indicated its concern over the availability of data on the engineering properties of rubber to the technical men in their customer companies. In specifying rubber in industrial products, the engineer in the customer company is too frequently influenced by his more thorough knowledge of the properties of metal and thus asks for rubber properties that are impossible to meet.

Among the organizations where data on the engineering properties of rubber are developed are the D-11 Committee of the American Society for Testing Materials and the Rubber and Plastics Division of the American Society of Mechanical Engineers.

In November, 1959, an International Rubber Conference was held in Washington, D. C., as a result of the joint efforts of the rubber oriented groups in ACS, ASTM, and ASME. It would appear that one way to achieve greater coordination in rubber technology would be to encourage more meetings involving the joint efforts of these three organizations.

R. G. Seaman

EDITOR

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# The Dynamic Mechanical Properties Of Some New Elastomers[1]

The similarity of *cis*-polybutadiene and *cis*-polyisoprene to natural rubber and of ethylene-propylene copolymers to SBR is shown. Chemically modified butyl rubbers are shown to differ from the more conventional types

By A. D. DINGLE

*Dunlop Canada, Ltd., Toronto, Ont., Canada*

CONSIDERABLE research effort has been expanded during the last few years by the rubber industry on the development of synthetic elastomers as potential replacements for natural rubber (NR) and styrene-butadiene rubber (SBR) in tires. SBR has found considerable usage in passenger-car and small truck tires; whereas NR dominates almost completely the market for truck-tire elastomers.

It is necessary that an elastomer for use in tires should possess dynamic mechanical properties that will allow operating temperatures below the degradation temperature of the tire cord used. Rayon cord truck tires have an upper operating temperature limit of approximately 125° C. (257° F.), and nylon cord truck tires, of approximately 150° C. (302° F.). Since the ambient temperature ranges from below freezing to above 38° C. (100° F.), tire operating temperatures may vary from as low as 50° C. (122° F.) for passenger-car tires to around 120° C. (250° F.) or higher for truck tires.

It is well known that the properties of vulcanized elastomers vary considerably with temperature. It is the purpose of this paper to provide data and to illustrate graphically the variation of power loss, dynamic modulus, and resilience with temperature from —40 to 150° C., and in particular the range from 25° C. (77° F.) to 125° C. for several recently announced elastomers and some of the older ones. The data were obtained under two conditions, that of constant load of 20 kg. (44.1 lbs.) and at constant strain of 10%.

[1] Presented before the Division of Rubber Chemistry, Canadian Institute of Chemistry, Kitchener, Ont., Canada, April 8, 1960.

## The Author

A. D. Dingle, manager of the physical research section, Dunlop Research Center, Dunlop Canada, Ltd., Toronto, Canada, received his B.S. in physics and mathematics from the University of Manitoba in 1949. He did postgraduate work in the same subjects and at the university in 1952 and 1953.

Mr. Dingle was employed as a physicist by the Canadian Defense Department at its Northern Laboratory, Fort Churchill, Manitoba, from 1950-1952. He joined Dunlop Canada, Ltd. in 1953, where he has remained since that time.

Mr. Dingle is a member of the American Society for Testing Materials, the Society of Rheology, the Institute of Textile Science, and the Ontario Rubber Group. He is an associate member of the Division of Rubber Chemistry of the American Chemical Society.

TABLE 1. COMPOUND FORMULATIONS AND PHYSICAL PROPERTIES

| Compounds | Urethane[a] | NR | SBR | PB[b] | PI[c] | E/P A[d] | E/P B[d] | E/P C[d] | E/P D[e] | Butyl E[f] | Butyl F[g] | Butyl G[h] | Butyl H[i] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Elastomer | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |
| HAF black | 30.00 | 50.00 | 50.00 | 50.00 | — | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 | 50.00 |
| Zinc oxide | — | 3.00 | 3.00 | 3.00 | 3.00 | — | — | — | — | 5.00 | 5.00 | 5.00 | 5.00 |
| Stearic acid | — | 3.00 | 1.00 | 5.00 | 3.00 | — | — | — | — | 1.00 | 1.00 | 1.00 | 1.00 |
| Pine tar | — | 3.00 | — | 5.00 | 3.00 | — | — | — | — | — | — | — | — |
| Process oil | — | — | 10.00 | — | — | — | — | [j]37.5 | — | [k]3.00 | [k]3.00 | [k]3.00 | [k]3.00 |
| Staybelite resin[l] | — | — | — | 5.00 | — | — | — | — | — | — | — | — | — |
| RCD 2098[m] | 0.35 | — | — | — | — | — | — | — | — | — | — | — | — |
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| Tellurac[r] | — | — | — | — | — | — | — | — | — | 1.00 | 1.00 | 1.00 | 1.00 |
| Sulfur | 1.50 | 1.75 | 1.75 | 1.75 | 2.25 | 1.00 | 1.00 | 1.00 | 1.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Dicup[s] | — | — | — | — | — | 4.00 | 4.00 | 4.00 | 4.00 | — | — | — | — |
| Cure time, min. | 60 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 45 | 30 | 30 | 30 |
| Temp., °F. | 287 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 | 307 |
| Tensile, psi. | 4300 | 3400 | 2900 | 3000 | 2900 | 1200 | 3200 | 2100 | 3000 | 2000 | 2200 | 2300 | 2200 |
| Modulus, 300% psi. | 2800 | 2000 | 1500 | 1300 | 1200 | 1100 | 1900 | 1100 | 2200 | 1600 | 1700 | 1800 | 2000 |
| Elong., % | 500 | 450 | 550 | 600 | 550 | 350 | 375 | 550 | 350 | 350 | 400 | 400 | 350 |
| Hardness, Shore | 70 | 68 | 63 | 60 | 63 | 55 | 65 | 58 | 73 | 68 | 65 | 68 | 70 |

[a] Adiprene C, E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, Wilmington, Del.
[b] Cis-4, Phillips Chemical Co., Akron, O.
[c] Shell Isoprene Rubber, Shell Chemical Co., Torrance, Calif.
[d] 60/40 mole % ethylene-propylene copolymer, Dunlop Rubber Co., Ltd.
[e] 50/50 mole % E/P, Dunlop Rubber.
[f] Polysar Butyl 301, 1.5% unsaturation, Polymer Corp., Ltd., Sarnia, Ont., Canada.
[g] Experimental butyl rubber, 4% unsaturation, Polymer Corp.
[h] Chlorine-containing butyl rubber, MD 551, now known as Enjay Butyl HT 10-66, Enjay Chemical Co., New York, N. Y.
[i] Experimental bromine-containing butyl rubber, MD 571, Enjay Chemical Co.
[j] Circosol 2XH, Sun Oil Co., Philadelphia, Pa.
[k] Polar 45, Imperial Oil Co., Toronto, Ont., Canada.
[l] Ester of hydrogenated rosin, Hercules Powder Co., Wilmington.
[m] MBTS-$ZnCl_2$ Complex, Du Pont elastomer chemicals department.
[n] Benzothiazyl disulfide, R. T. Vanderbilt Co., New York.
[p] Mercaptobenzothiazole, R. T. Vanderbilt.
[q] N-oxydiethylene benzothiazole-2-sulfenamide, American Cyanamid Co., Bound Brook, N. J.
[r] Tellurium diethyl dithiocarbamate, R. T. Vanderbilt.
[s] Dicumyl peroxide, Hercules Powder.

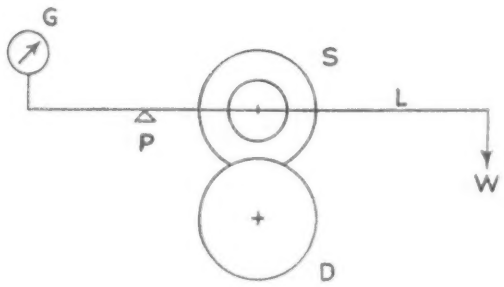



**Fig. 1. Schematic diagram of rotary power loss machine. S is rubber sample; L is lever system; D, driving motor; W, weight adding position; P, pivot; and G is dial gage**

Formulations, curing conditions, and some of the conventional physical properties of the several elastomer compounds used are given in Table 1.

## Apparatus and Procedure

The apparatus used for obtaining data on dynamic mechanical properties of the compounds was that of D. Bulgin and G. D. Hubbard[2] and is represented schematically in Figure 1. The sample S is an annulus of rubber, four inches in outside diameter and with a ¾- by ¾-inch cross-section, which is molded to a 2½-inch o.d. metal core and which, in turn, is mounted on a free running shaft carried on the lever system. The sample is rotated by the driving drum D. The dial gage G is placed at an equal distance from the pivot P and from the center of the metal core on which the sample is mounted. This dial gage is set at zero when the sample is in skimming contact with the driving drum; consequently any change in the gage reading is a resulting deflection change in the sample. The load is applied to the sample by weights suspended at the end of the lever system at point W.

The driving drum of this apparatus is rotated by a synchronous motor, the stator of which is freely suspended. When energy is absorbed in the sample, the reaction torque on the motor causes the stator to swing to a position such that the additional motor torque is balanced by the gravitational torque of the displaced stator. The energy loss is determined by a pointer attached to the motor stator, which pointer moves over a fixed scale calibrated in joules per revolution. This pointer is also adjusted to zero when the sample wheel is in skimming contact with the driving drum.

The sample is surrounded by an electrically heated oven so that its temperature may be raised by external heat as well as by the heat energy generated in the

[2] *Trans. Inst. Rubber Ind.*, 34, 5, 201-227 (1958).

sample during testing. The rate of temperature rise of the sample is controlled between 1° and 2° C. (1.8 to 3.6° F.) per minute by a variable transformer, and the temperature is measured by a thermocouple passed through the sample, the leads of which are brought out to rotating joints at either end of the free running shaft and then to a potentiometer for continuous measurement. The rotating joints are lubricated with graphite grease.

For each measurement, readings are taken of energy loss in joules/rev., deflection in millimeters from the dial gage, and temperature in °C. The machine is normally run under a constant load of 20 kg., and readings are taken every 5° C. (9° F.) except for temperatures of 25, 50, 75, 100, and 125° C., where additional readings are taken for loads of 16.4, 23.7, and 28.8 kg. (36.2, 52.3, and 63.5 lbs.).

The deflection measured must be corrected for thermal expansion in the sample, which is accomplished by periodically rezeroing the dial gage G and proportionating the difference accordingly. The sample is cooled to —50° C. (—58° F.) for one-half hour in dry ice prior to testing.

## Description of Typical Curves

The results of the test runs with the several elastomer compounds are plotted as curves of power loss at 20 kg. load, power loss at 10% strain, modulus at 10% strain, deflection, and resilience as functions of temperature.

[3] *Brit. J. Applied Phys.*, 3, 373 (1952).
[4] *SPE Journal*, 16, 5, 528 (1960).

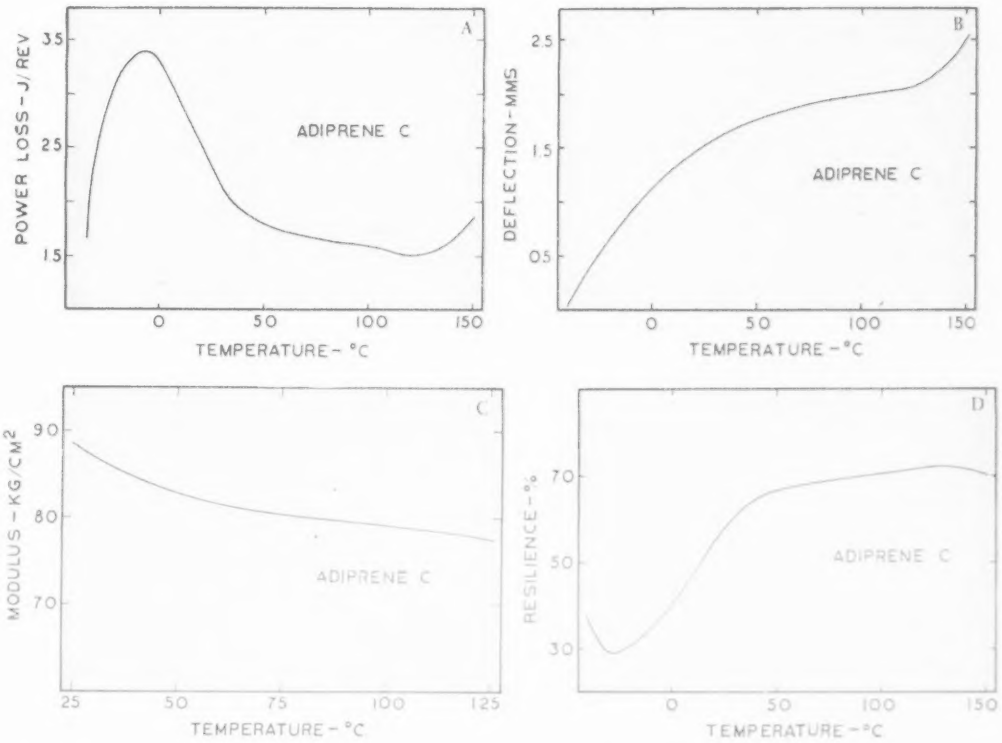
Two temperatures are most helpful in defining the temperature-properties range of elastomers, the second-order transition temperature and the critical temperature. The second-order transition temperature is defined by K. L. Floyd[3] as the temperature at which side groups and chain segments start to rotate and vibrate. The critical temperature is defined by D. Bulgin and G. D. Hubbard[2] as the temperature at which maximum resilience occurs. Above the critical temperature, a permanent change takes place within an elastomer compound, that is, rearrangement of cross-links, chain scission, etc.; while below the second-order transition temperature, the elastomer behaves as a rigid solid.

## Power Loss at 20-Kg. Load

The curve for the mechanical damping of an elastomer shows, in general, a single peak which is due to the second-order transition of the polymer. L. E. Nielsen[4] states that secondary transitions may arise because of the following factors: (1) side groups; (2) two-phase systems or aggregates; (3) morphological and other effects, such as crystal size in crystallizing-type polymers or intergrain slippage.

The curve for power loss at 20-kg. load variation with temperature shows the power loss to be low below the second-order transition temperature because of the

**Fig. 2. Variation of properties with temperature for a urethane elastomer (Adiprene C). Graph 2A is power loss per cycle under 20-kg. load; 2B, deflection; 2C, dynamic modulus at 10% strain; and 2D is resilience**



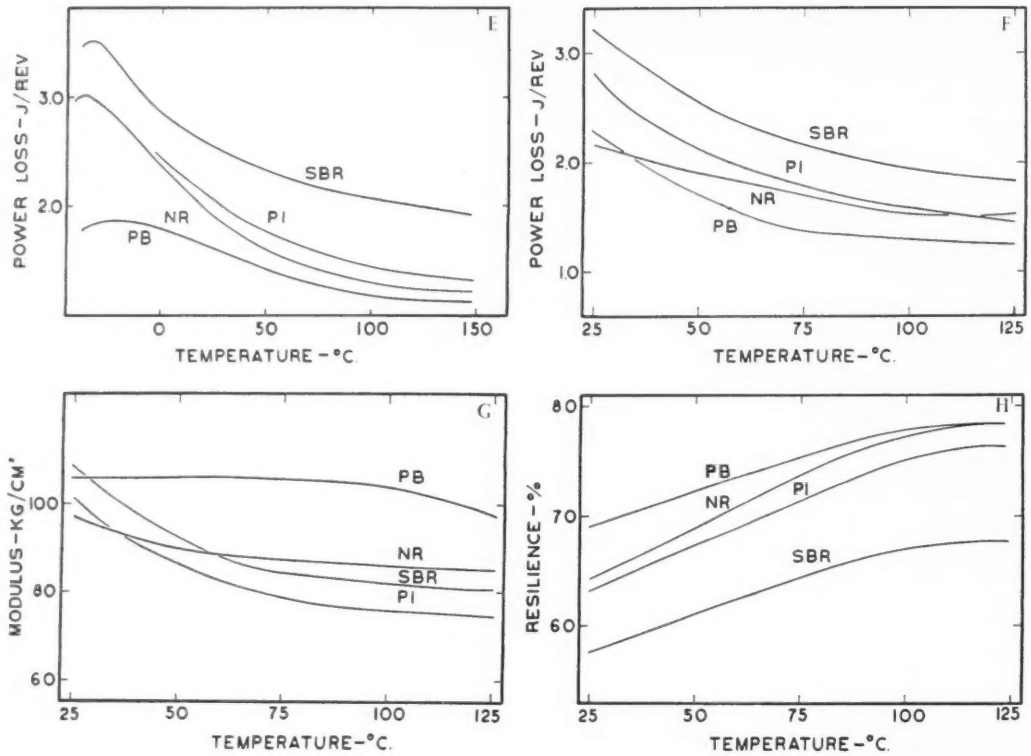



**Fig. 3. Variation of properties with temperature for *cis*-polybutadiene (PB), *cis*-polyisoprene (PI), natural rubber (NR), and styrene-butadiene (SBR). Graph 3E is power loss per cycle under 20-kg. load; 3F, power loss per cycle at 10% strain; 3G, dynamic modulus at 10% strain; and 3H is resilience**

extreme hardness of the sample, to increase sharply owing to the second-order transition temperature and to decrease continuously provided no further secondary transitions exist until the critical temperature is reached, and then to increase again. The maximum power loss occurs at a temperature several degrees higher than the second-order transition temperature. Figure 2A illustrates the general shape of such a curve which is for the power loss in joules/rev. as indicated by the pointer fixed to the driving motor stator *versus* temperature.

## Power Loss at 10% Strain

Owing to sample hardness, it is not possible to obtain a 10% strain until a temperature considerably above the second-order transition temperature is reached. Hence this property is measured for the tire operating range, that is, from 25 to 125° C.

Power loss at 10% strain decreases with increasing temperature and is measured from curves of power loss *versus* deflection determined under varying loads at temperatures of 25, 50, 75, 100, and 125° C. Figure 3F is an example of a curve of power loss at 10% strain *versus* temperature.

## Deflection

The deflection increases sharply above the transition temperature to a fairly temperature invariant value. This value is maintained until the critical temperature is reached, after which the deflection increases rapidly again, as shown in Figure 2B for a urethane elastomer with a critical temperature of 130° C. The data for this curve were obtained from the readings of dial gage G corrected for the thermal expansion of the sample *versus* temperature.

## Dynamic Modulus

Since the dynamic modulus is amplitude-dependent in carbon black reinforced stocks, it is calculated at 10% strain over the temperature range 25 to 125° C.

Modulus *versus* temperature curves, in general, show decreasing values for modulus with increasing temperature, as shown in Figure 2C for a urethane elastomer.

Dynamic modulus is calculated from the equation[2] given below

$$M = K_n P$$

where P = load at 2 mm. deflection

$K_n$ = gradient factor depending on slope of log load *versus* log deflection plot. If slope is 1.5, then $K_n = 3.7$; and if the slope is 1.0, then $K_n = 3.0$.

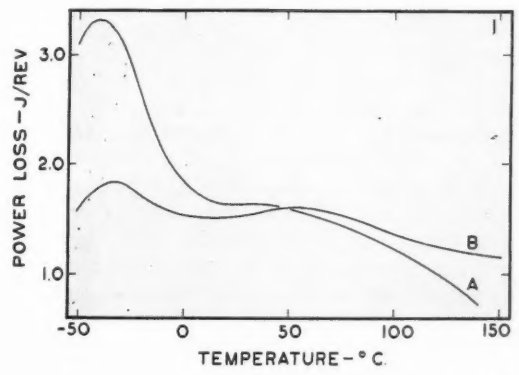
## Resilience

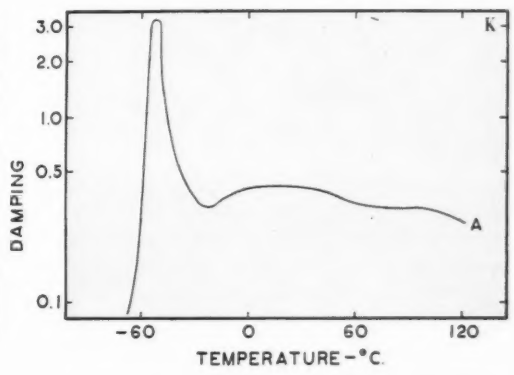
In curves for resilience *versus* temperature, the values for resilience, in general, increase from a minimum at a point which can be regarded as a second-order tran-

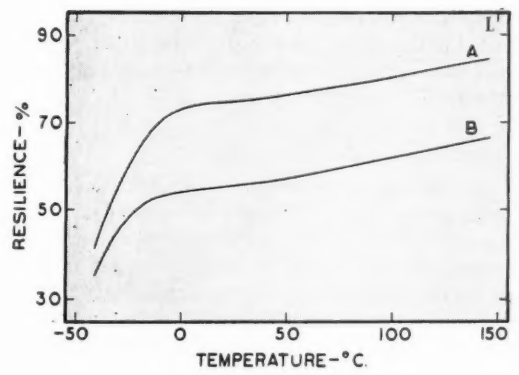
Fig. 4. Variation of properties with temperature for ethylene-propylene copolymers. Graph 4J is power loss per cycle under 20-kg. load for a 60/40 mole % E/P with curve A, a gum compound, and curve B, a carbon black reinforced compound. Graph 4K is mechanical damping as determined on torsional pendulum for a lightly cured E/P gum compound. Graph 4L is resilience for compounds A and B of graph 4J; 4M is power loss per cycle under 20-kg. load for E/P elastomer compound C extended with 37.5 parts of oil and for E/P elastomer compound D made from a 50/50 mole % copolymer; 4N is power loss at 10% strain for E/P compounds C and D and an SBR compound; 4P is the dynamic modulus which was recorded for the compounds C and D and also for an SBR compound

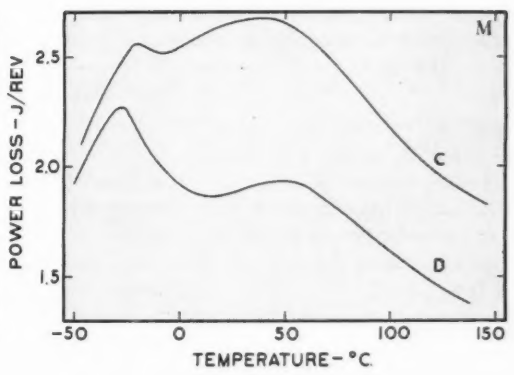
TABLE 2 RESILIENCE OF 40/60 MOLE % E/P COMPOUND AT VARIOUS % STRAIN AND TEMPERATURES

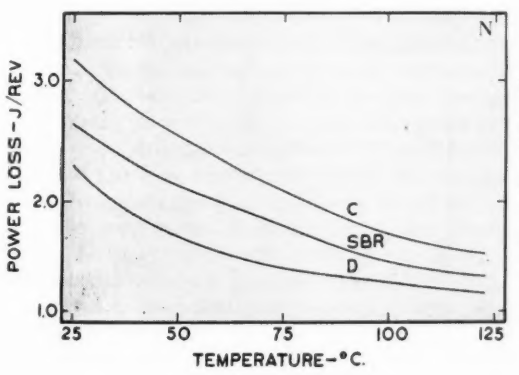
| Temperature °C. | | Load Kg. 16.4 | 20.0 | 23.7 | 28.8 |
|---|---|---|---|---|---|
| 25 | % Strain | 6.8 | 7.2 | 7.8 | 8.4 |
| | % Resilience | 58.2 | 58.6 | 58.3 | 58.1 |
| 50 | % Strain | 10.1 | 11.8 | 13.4 | 15.8 |
| | % Resilience | 60.2 | 60.5 | 60.4 | 60.8 |
| 75 | % Strain | 11.5 | 13.5 | 15.4 | 17.6 |
| | % Resilience | 64.0 | 64.7 | 64.8 | 65.1 |
| 100 | % Strain | 11.8 | 13.8 | 15.7 | 18.2 |
| | % Resilience | 68.4 | 68.7 | 68.9 | 68.9 |
| 125 | % Strain | 11.8 | 13.8 | 15.7 | 18.2 |
| | % Resilience | 71.8 | 72.1 | 71.9 | 71.9 |

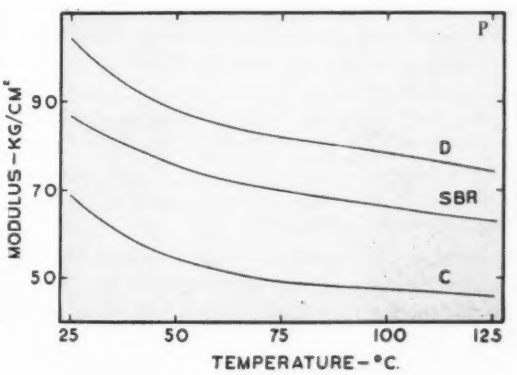


sition temperature to a maximum value at the critical temperature. Above this critical temperature, resilience decreases, as is shown in Figure 2D, again for a urethane elastomer.

Table 2 gives resilience values for a 40/60 mole % ethylene-propylene copolymer at five different temperatures and for four applied loads. The values indicate clearly the constancy of resilience with higher amplitudes.

Resilience is calculated from the equation[2] which is shown below.

$$R = \left( - \frac{L}{2\, C_n\, P \sqrt{d}} + \sqrt{1 + \frac{L}{(2\, C_n\, P \sqrt{d})^2}} \right)^2$$

where L = energy loss in joules/rev.

P = load in kg.

d = deflection in mm.

$C_n$ = gradient factor, depending on the slope of the log load *versus* log deflection plot. If the slope is 1.5, then $C_n = 0.165$; and if the slope is 1.0, then $C_n = 0.185$.

## Properties of Elastomers

### Urethanes

The variation of the properties of power loss at 20-kg. load, deflection, resilience, and modulus at 10% strain with temperature for a urethane elastomer (Adiprene C) is shown in Figures 2A, 2B, 2C, and 2D.

The power loss maximum at −8° C. (17.6° F.) is at a substantially higher temperature than the second-order transition temperature; whereas the resilience minimum at −30° C. (−22° F.) is much closer to the second-order transition temperature. All the curves for this elastomer, except for modulus, show a critical temperature of about 130° C.

### *Cis*-Polybutadiene and *Cis*-Polyisoprene

The variation of the properties of power loss at 20-kg. load, power loss at 10% strain, modulus at 10% strain, and resilience with temperature for *cis*-polybutadiene and *cis*-polyisoprene are shown in Figures 3E, 3F, 3G, and 3H. Values for NR and SBR are given for comparison.

The superiority of NR to SBR in power loss and resilience can be seen from these curves. It is these features of high power loss and low resilience that restrict SBR to passenger-car tire usage. The similarity of the values for power loss and resilience of *cis*-polybutadiene and *cis*-polyisoprene to natural rubber should be noted. The dynamic modulus of *cis*-polyisoprene is slightly lower than that for natural rubber; while the modulus values for *cis*-polybutadiene are much higher than for natural rubber.

### Ethylene-Propylene Copolymers

The changes in the properties of power loss at 20-kg. load with temperature for a 60/40 mole % ethylene-propylene copolymer, as a gum compound A and as a carbon black reinforced compound B, are shown in Figure 4J. The maximum at −30° C. (−22° F.) is due to the second-order transition temperature of the E/P copolymer; the minor second maximum at 50° C. (122° F.) is the result of ethylene block crystallinity. The second maximum is not affected too much by the addition of the 50 parts of HAF carbon black (curve B), but the second-order transition temperature is less than that for the gum stock (curve A) and has a somewhat broader peak.

The existence of the minor second maximum or transition temperature was verified by obtaining data on mechanical damping *versus* temperature with the torsional pendulum, which curve (Figure 4K) shows a broad maximum between 0° and 50° C. The sample tested on the torsional pendulum represented a different cure state than the gum compound A in that it was cured using only one part of dicumyl peroxide (Dicup). Torsional pendulum testing requires stocks with a minimum of cross-links.

Figure 4L shows that the E/P gum compound A has fairly good resilience; while the carbon black stock B has resilience in the range which would be expected from a comparable SBR compound.

The variation in properties of power loss at 20-kg. load, power loss at 10% strain, and dynamic modulus at 10% strain with temperature for a 60/40 mole % E/P compound C extended with 37.5 parts of oil, and a 50/50 mole % E/P compound D, are shown in Figures 4M, 4N, and 4P. Figures 4N and 4P illustrate that with proper compounding E/P compounds can be made to approximate the power loss and dynamic modulus properties of SBR.

It has yet to be established, however, whether the second maximum transition temperature in Figures 4J and 4M due to ethylene crystallinity can be either eliminated in the polymerization stage, or, if not, whether it will have any adverse effect in the dynamic applications of these E/P copolymers.

### Isoprene-Isobutylene Copolymers

The change in the properties of power loss at 20-kg. load, power loss at 10% strain, and modulus at 10% strain with temperature for compound E, a 1.5% unsaturation butyl rubber (Polysar 301), and compound F, an experimental butyl rubber containing 4% unsaturation, are illustrated in Figures 5Q, 5R, and 5S. Note that there are only slight differences between the power loss and dynamic modulus values for compounds E and F.

The maximum values for power loss are lower, and the resilience values higher for chlorine-containing butyl rubber compound G and bromine-containing butyl rubber compound H than for the values for the compounds E and F, which are not chemically modified. See Figures 5T and 5U.

The higher power loss level and the lower resilience explain why commercial butyl rubber has good mechanical damping properties at room temperature. Commercial butyl rubber is also a good elastomer at temperatures considerably above room temperature as evidenced by the values for these properties obtained from tests performed at 100° C.

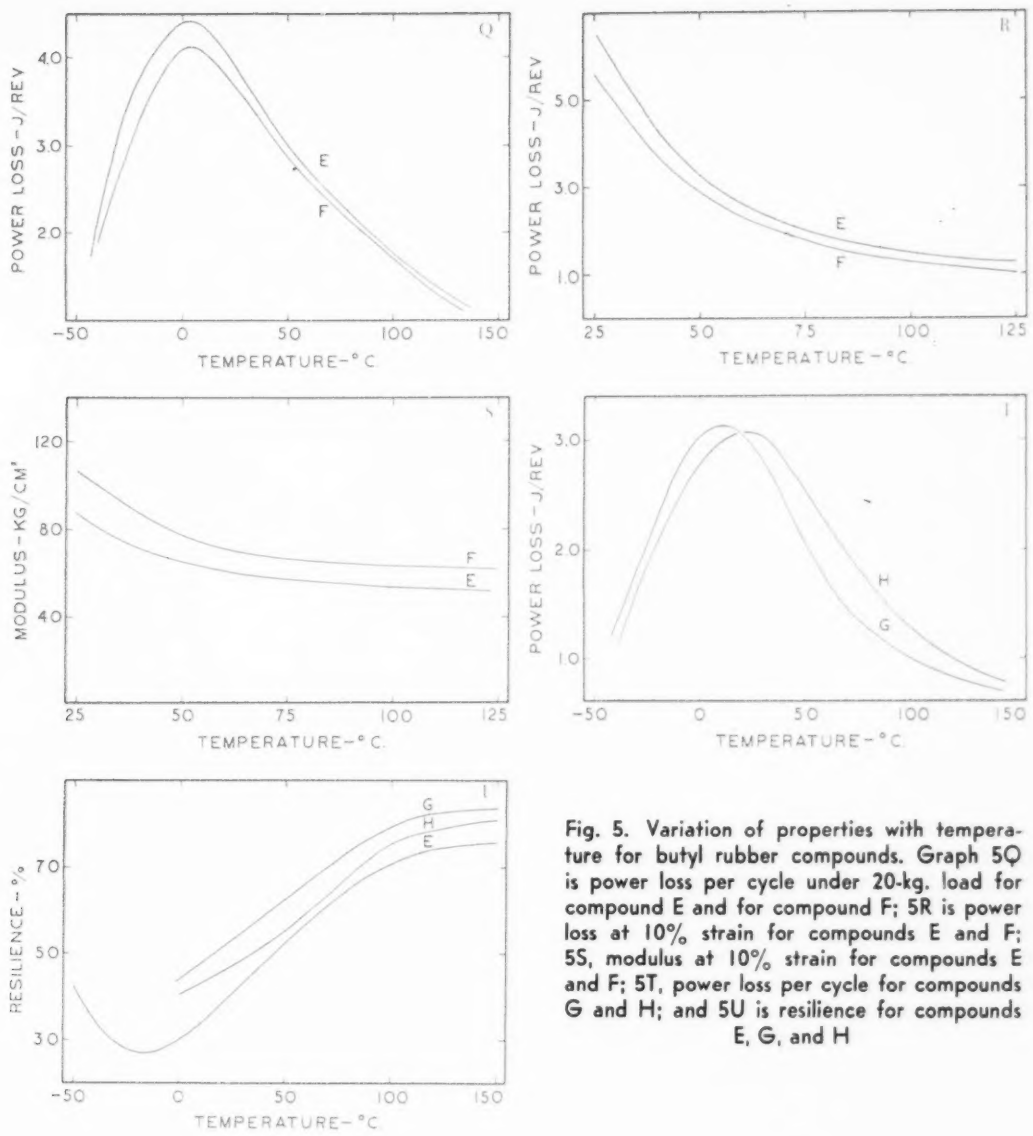



**Fig. 5. Variation of properties with temperature for butyl rubber compounds. Graph 5Q is power loss per cycle under 20-kg. load for compound E and for compound F; 5R is power loss at 10% strain for compounds E and F; 5S, modulus at 10% strain for compounds E and F; 5T, power loss per cycle for compounds G and H; and 5U is resilience for compounds E, G, and H**

## Summary and Conclusions

Experimental results have been obtained which show the similarity of *cis*-polybutadiene and *cis*-polyisoprene with natural rubber, and the similarity of ethylene-propylene copolymers with SBR, in the properties of power loss, resilience, and modulus.

Ethylene-propylene copolymers exhibit a second transition temperature due to ethylene block crystallinity, however, and it is not known what effect this second transition temperature will have in dynamic applications of these elastomers.

Butyl rubbers containing higher unsaturation than some of the commercial grades have about the same dynamic mechanical properties as do the latter. Chemically modified butyl rubbers show lower power loss and higher resilience at a given temperature when compared to commercial grades of butyl rubber.

## Acknowledgment

Acknowledgment is made to the following companies for the samples of the newer elastomers used in this investigation: E. I. du Pont de Nemours & Co., Inc., for the Adiprene C; Phillips Petroleum Co. for the Cis-4 polybutadiene; Shell Chemical Co. for the synthetic polyisoprene; Polymer Corp., Ltd., for the butyl rubber of approximately 4% unsaturation; Enjay Co., Inc., for the chloro- and bromobutyl rubbers.

The author expresses his appreciation to L. Nielsen, Monsanto Chemical Co., for obtaining the torsional pendulum data presented in Figure 4K.

The author thanks the directors of the Dunlop Rubber Co., Ltd., in whose Canadian laboratories the work was carried out and for permission for publication, and the members of the laboratory staff at Toronto who assisted in the operation of the test machine.

# Is There a Car Shaker in Your Future?

## Such devices may be useful in rubber plants for unloading granular materials

By E. A. GAHL

*Processing Machinery Department, Allis-Chalmers Mfg. Co., Milwaukee, Wis.*

THE answer to this query should be an unqualified "yes" if an analysis of your operation shows a shaker to be economically feasible for unloading granular materials from hopper bottom railway cars.

Not uncommon is the experience of one firm whose car shaker paid for itself in eight months. In addition, it released employes for use elsewhere and promoted greater safety by keeping them out of the car.

Car shakers are available for unloading all types of bulk materials from railroad cars including the 70-ton hopper bottom cars. There are three general types of shakers—the vibrator unit mounted alongside the car to be unloaded; the eave mounted shaker; and the side arm shaker which fastens to top and bottom of one side of the car.

In the eave mounted shaker, eccentric shafts or adjustable eccentric disks are used to create the throw. The latter are generally set at maximum throw and never readjusted. Because of its manner of operation, the rotary unloader, which completely inverts the car to empty it, fails to qualify as a shaker.

The safety factor is paramount in all these types of shakers since it eliminates the ever-present hazard of possible serious injury to employes who may climb directly on to the material in cars. In addition, car shakers require fewer men—a reduction from three to one, for example, in the case of one plant. Besides the reduction in workers for this operation, unloading was completed in a matter of minutes as against 3¾ manhours previously required.

Each of the various types of shakers claims additional attributes besides safe, fast, economical, and easy unloading of materials. These include lower initial cost based on type, quieter operation, and more effective vibrating action.

### Principle of Operation

The principle of the car shaker is simple. It must produce a relative movement between the slope plates of the car and the material within. Nearly all hopper cars used for bulk materials are built with steel-plate floor slanted 30 degrees to the horizontal. Under ideal conditions bulk products with slide angles of 30 degrees or less will flow completely out of cars by gravity. Those with slide angles over 30 degrees, however, will flow from the car only when the angle between the horizontal and top surface of the products is equal to the angle of slide. To remove the remaining material some other external force must be applied. And for safe and rapid unloading, that is where the car shaker enters the picture.

It is interesting to note that various materials used in the rubber industry have more than 30-degree slide angle. For example, sulfur has a 32-degree angle of slide; ground scrap rubber, 35 degrees, and zinc oxide, 40 degrees. Packing of the materials in transit, moisture, and partial freezing, however, will increase the angle of slide. For a one-degree increase in slide angle, the percentage of the load remaining in the car increases nearly 2%. If the speed of the shaker is too low, it will fail to dislodge the materials remaining.

Also to be considered in some cases is the weight limit of the car. Material may have such a high specific weight that the car cannot be loaded full and level without exceeding the weight limit. Starting with a smaller total volume, a reduced volume of the product will gravitate from the car. Also, a lower volume of material may remain in the car, depending upon the angle of slide and other conditions.

Before deciding upon a suitable type of shaker for your operations, it would be well to make a study of your requirements and facilities. Possibly existing conveyors, hoppers, and other equipment could be easily rearranged and utilized in the new installation.

### Eave Mounted Shaker

Heavy-duty shakers which rest on the eaves of the car causing the side plates to vibrate through a small amplitude are in general use today. (See Figure 1.) This vibration joggles the material down along the plates to the hopper opening.

While more coal is unloaded by car shaker than any other material, it is possible to use a single unit for unloading any of the essential granular materials used in the production of rubber products where adequate facilities are provided for handling and operating the shaker. In general, the capacity of the conveying facilities limits the capacity of the shaker.

By using a car shaker with a trolley-operated hoist and moving it to cars containing different materials, it is possible to empty them into a common hopper.

The eave mounted shaker in use today is usually raised and lowered on to the car by an electric hoist supported by a 9- to 12-inch overhead I beam or two channels back to back. (See Figure 2.) All safety interlocked operating controls are wired into the control panel comprising an integrated unit. For certain operating conditions, however, the shaker can be fitted with a separate starter and moved about with a power or portable crane.

Hoists can be lug, base, or trolley mounted. Where

**Fig. 1. Five-ton car shaker with 15-h.p., 1800-r.p.m., low starting current, high-torque weather and dust protected motor, unloading coal**

material is to be unloaded over two bins or tracks, a trolley hoist must be used. The standard trolley hoist is generally designed to operate parallel with the lifting beam; however, the cross-mounted, twin-hook drum hoist saves head room. In any event, whether it is a cross-mounted or parallel hoist, it is always balanced to work effectively with the car shaker. Hoists with twin hooks prevent the shaker from rotating so that it is properly positioned on the eaves of the car without manual assistance.

Chains between lift bars of the car shaker and hoist blocks are a definite safety feature. When lowering the car shaker to the gondola car, the hoist overruns slightly to provide slack in the chains. This slack cushions the vibration of the shaker so that it is not transmitted to the hoist. Chains are preferred to cables since wear on the links can be more readily detected before a break occurs.

Unloading frozen, fine, or wet bulk materials requires somewhat more time because of an increase in the angle of slide. A dry product, for example, which will slide at an angle of 29 degrees will require a 40-degree angle when damp. The car shaker, however, is capable of completing the task more rapidly and safely than is possible in any other way.

## Car Thawers

In northern installations, radiant heat produced by oil or gas burners from refractory-lined pits is used to heat car hoppers uniformly in freezing temperatures. By using a pit under each, it is possible to thaw out the material in 15 to 30 minutes under average winter conditions. Where less than five cars per day are thawed, portable oil-fired or gas-burning car-thawing tube equipment is available.

Most recent development is a factory assembled automatic car thawer consisting of assemblies of steel sheath electric infrared panels. Each 94-inch long, 46-inch high, and 36-inch wide unit has a series of resistance-type alloy-sheathed heating rods encased in an aluminum alloy heavy-duty extrusion.

Indirect heating methods are recommended in preference to hand-torches which tend to damage car hoppers, air-brake packings, etc., by their direct flame contact.

## Shaker Size

In general, the amount and type of material to be unloaded will determine the size of the car shaker. For example, a 3½-ton shaker is adequate for unloading 10 cars or more per day of 0- by 4-inch material; while for 0- by 2- and 0- by ½-inch dry or wet material, the 5-ton shaker is recommended.

The standard 5-ton shaker provides a 12-inch clearance arch above the car which is ample for all standard gondola cars. Available for higher loads, such as ore piled on to the cars for their short runs to the smelter or docks, is a shaker with a 24-inch clearance.

Car shakers need little maintenance. Motor bases are rubber mounted or supported on steel springs. They are V-belt or chain driven. Short center V-belt drives eliminate belt whipping. Belt tension and motor mounts should be inspected periodically. A stock of spare parts carried on hand, including a set of bearings and motor base supports, will assure minimum downtime.

Some car shaker bodies are stress relieved prior to machining which delays fatigue. While this treatment adds to the manufacturing cost, it means less-maintenance for the user.

Shoe wear plates are available for all car shakers. Some operators prefer to use them to protect the contact shoes that ride the top of the gondola cars. Others find that the large contact areas which carry the weight of the shaker are adequate for all requirements.

## Summary

In summary, your choice and type of car shaker are one which will best fill your specific needs. If the unit is to be economically effective, it is important that handling facilities be adequate to carry away the product as it is dumped into the hopper on to the conveyor. The hopper should always be large enough to hold one carload of the bulk material.

A fair investigation and comparison of the types of car shakers available will enable you to determine whether unit initially costing a few dollars more may be worth many times more in trouble-free service.

**Fig. 2. Three and one-half-ton car shaker suspended from structural frame. Push-button control permits one man to start, stop, raise, and lower the unit**

# Factors Affecting Weather Resistance of "Hypalon" Chlorosulfonated Polyethylene[1]

Proper Selection of Color Pigments, Fillers, Curing System, and Type Of "Hypalon" Required to Obtain Maximum Exposure Resistance

By P. A. PEFFER, JR., and R. R. RADCLIFF

*E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.*

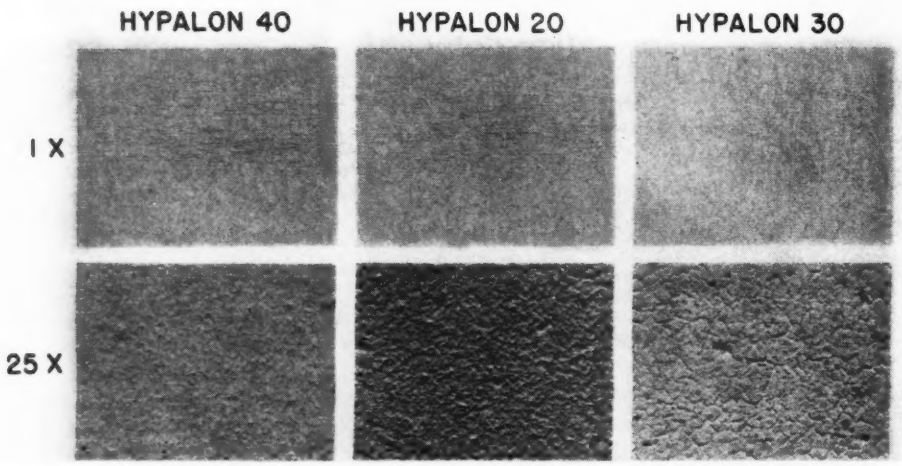



Fig. 1. Results of one-year exposure in Florida on "Hypalon" 20, 30, and 40 type vulcanizates (magnifications 1X and 25X)

THE outstanding weather resistance of chlorosulfonated polyethylene ("Hypalon") vulcanizates was first described by R. R. Warner *et al.* in 1952.[2] Continued experience in applications such as fabric coatings, extruded products, and white sidewalls for tires confirms these earlier findings. In addition, exposure tests indicate that compounding ingredients have a greater influence on the durability of "Hypalon" vulcanizates than was previously recognized. This paper discusses the effect of curing systems, color pigments, fillers, and the various types of chlorosulfonated polyethylene on the weather resistance of "Hypalon" vulcanizates.

## Test Procedure

All compositions discussed herein were prepared in accordance with the procedures established by the American Society for Testing Materials, Philadelphia 3, Pa. Test specimens were prepared from press-cured 3- by 3- by 0.075-inch or 6- by 6- by 0.175-inch slabs or coated steel panels. These were exposed at an angle of 45 degrees facing south either in Florida or Delaware.

Stress-strain, tensile strength, and elongation at break values were obtained according to ASTM D 412-51T and hardness values according to ASTM D 676-55T.

## Types of Chlorosulfonated Polyethylene

Three types of "Hypalon" chlorosulfonated polyethylene are commercially available at present: "Hypalon" 20, "Hypalon" 30, and "Hypalon" 40. All have certain properties which make them useful in different applications, and all can be compounded for excellent outdoor durability. Although long-term weathering comparisons are not yet available, small differences have been noted after short exposures which may prove significant. For example, a comparison of compounds from "Hypalon" 20, 30, and 40 are shown in Figure 1 (Table 1). These samples were exposed in Florida for one year and are shown at both 1X and 25X

[1] Presented before the Division of Rubber Chemistry, ACS, Buffalo, N. Y., May 5, 1960. Contribution No. 167 of the Du Pont elastomers laboratory.

[2] *Rubber Age (N.Y.)*, 71, 205 (1952).

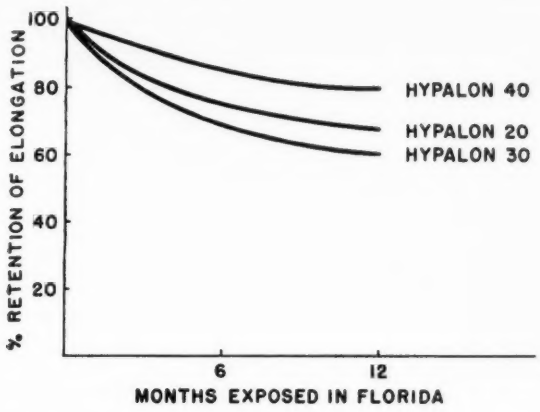



Fig. 2. Effect of "Hypalon" type on elongation after exposure in Florida

TABLE 1. COMPOUNDS OF DIFFERENT "HYPALON" TYPES USED IN FIGURES 1 AND 2 EXPOSURE TESTS

| | | | |
|---|---|---|---|
| "Hypalon" 20* | 100 | — | — |
| 30* | — | 100 | — |
| 40* | — | — | 100 |
| Litharge | 25 | 25 | 25 |
| Titanium dioxide† | 50 | 50 | 50 |
| Benzothiazyl disulfide‡ | 0.5 | 0.5 | 0.5 |
| Di-pentamethylene thiuram tetrasulfide§ | 2.0 | 2.0 | 2.0 |

* Du Pont elastomer chemicals department, Wilmington, Del.
† Ti-Pure R-500, Du Pont pigments department, Wilmington.
‡ MBTS, Du Pont elastomer chemicals department.
§ Tetrone A, Du Pont elastomer chemicals department.

magnification. Under the 1X magnification, all three specimens appear in excellent condition, but the 25X photograph shows that there is decreasing surface crazing in the order of "Hypalon" 30 to "Hypalon" 20 to "Hypalon" 40.

This order of stability is confirmed by the changes in elongation (Figure 2, Table 1) which these specimens exhibit. "Hypalon" 30 shows very good retention of elongation after one year in Florida, but "Hypalon" 20 or 40 is superior. Although other experiments have demonstrated that all "Hypalon" compounds will reach a leveling off point in elongation, it seems that "Hypalon" 40 provides maximum weathering resistance.

Several of the compounds used for the long-term weathering comparisons are based on "Hypalon" S-2, which is no longer commercially available. Exposure tests indicate that "Hypalon" S-2 compounds are approximately equivalent in durability to "Hypalon" 40.

## Curing Systems

Two main types of curing systems are used to vulcanize "Hypalon": those based on magnesium oxide and those based on lead oxide or its complex tri-basic lead maleate. These systems develop different properties in "Hypalon" vulcanizates and also influence their aging characteristics during outdoor exposure.

Vulcanizates containing magnesium oxide show excellent retention of color and surface integrity during outdoor exposure. We have found, however, that hardness increases very rapidly during exposure when the concentration of magnesia exceeds 5 phr. (Figure 3, Table 2). It is believed that this phenomenon is caused by the formation of magnesium chloride during vulcanization and its subsequent combination with water and magnesium oxide during aging to form a cement-like hydrate having the approximate composition: $MgCl_2 \cdot 5\ MgO \cdot 17\ H_2O$.[3] The abrupt change in tendency to harden as magnesia concentration is increased above 5 phr. suggests that a reinforcing structure develops when a threshold concentration of "cement" is produced.

Recent work has been directed toward the development of systems composed of a small amount of magnesia and an activator since early investigations[4] in-

[3] A. Nersasian, private communication.
[4] M. A. Smook, I. D. Roche, W. B. Clark, O. G. Youngquist, India RUBBER WORLD, 128, 54 (1953).

P. A. Peffer, Jr. R. R. Radcliff

## The Authors

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Mr. Radcliff was a development compounder for United States Rubber Co., 1939-41, and associate chemist for Essex Rubber Co., 1941-45, and has been at the elastomer chemicals laboratory from 1945 to date. He also is a member of the American Chemical Society.

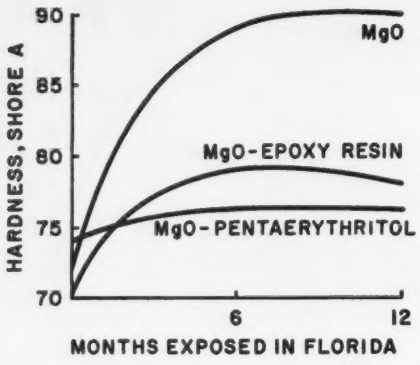



Fig. 3. Effect of MgO concentration on hardness of "Hypalon" compounds during Florida exposure

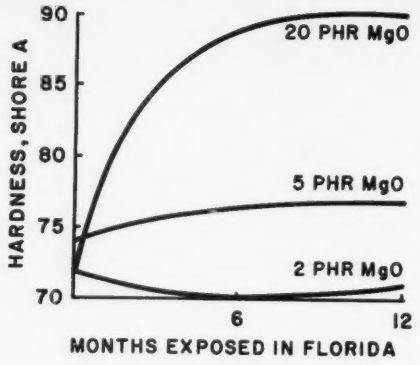



Fig. 4. Comparison and effect on hardness of different MgO during systems for "Hypalon" after exposure in Florida

TABLE 2. COMPOUNDS OF VARYING MgO CONTENT

| | | | |
|---|---|---|---|
| "Hypalon" 40 | 100 | 100 | 100 |
| Magnesium oxide* | 2 | 5 | 20 |
| Pentaerythritol | 3 | 3 | — |
| Titanium dioxide† | 50 | 50 | 50 |
| Calcium carbonate‡ | 50 | 50 | 50 |
| Di-pentamethylene thiuram tetrasulfide (Tetrone A) | 2 | 2 | 2 |

Cure: 30′/307° F.

* Maglite D, Merck & Co., Marine Magnesium Division, Rahway, N. J.
† Ti-Pure R-610, Du Pont pigments department.
‡ Atomite Whiting, Thompson, Weinman & Co., New York.

TABLE 3. COMPOUNDS FOR COMPARISON OF MgO CURING SYSTEMS

| | | | |
|---|---|---|---|
| "Hypalon" 40 | 100 | 100 | 100 |
| Magnesium oxide (Maglite D) | 3 | 5 | 20 |
| Pentaerythritol | — | 3 | — |
| Epoxy resin* | 4 | — | — |
| Titanium dioxide (Ti-Pure R-610) | 50 | 50 | 50 |
| Calcium carbonate (Atomite Whiting) | 50 | 50 | 50 |
| Di-pentamethylene thiuram tetrasulfide (Tetrone A) | 2 | 2 | 2 |

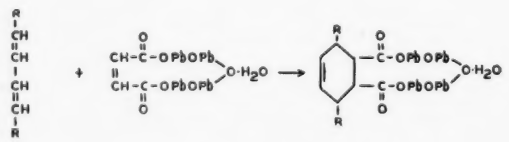
Cure: 30′/307° F.

* Epon 562, Shell Chemical Co., New York.

dicated that more than 5 phr. of magnesia is needed to achieve practical vulcanization cycles. This work has resulted in the development of curing systems based on combinations of magnesia-pentaerythritol and magnesia-epoxy resin. These systems produce vulcanizates with properties and aging characteristics which are similar to those obtained with high concentrations of magnesia, except that extreme hardening during outdoor aging is not observed (Figure 4, Table 3).

Tri-basic lead maleate and magnesia curing systems have different effects on the weatherability of "Hypalon." Tri-basic lead maleate influences the retention of surface characteristics; magnesia influences the rate of change of hardness. A relatively large amount of tri-basic lead maleate (40 phr.) appears necessary to obtain long-range stability of color and surface. Reducing the concentration to 25 phr. results in rapid deterioration of the surface. Since this phenomenon occurs in compounds that are properly screened against ultraviolet radiation, another factor, namely oxidation, is probably the cause of the degradation. Further, since it is sensitive to tri-basic lead maleate concentration, the lead complex must be acting as an oxidation stabilizer. A possible explanation of this effect is that tri-basic lead maleate undergoes a Diels-Alder addition with any conjugated unsaturation that forms as a result of ultraviolet light catalyzing the loss of hydrogen chloride from the polymer. Stabilization may thus occur by virtue of the elimination of these reactive sites through adduct formation.

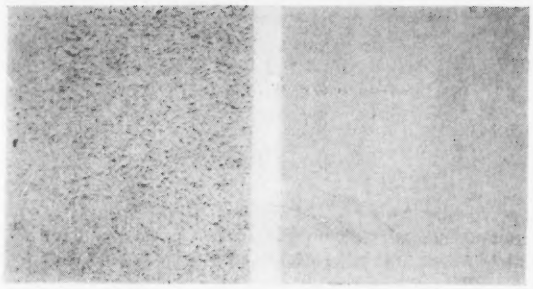
For example:




Similar reactions have been proposed for the role of tri-basic lead maleate in the stabilization of PVC.[5]

It has also been found that phenolic antioxidants inhibit the surface changes that occur when only 25 phr. of tri-basic lead maleate are used. The use of an antioxidant allows a reduction in the required amount of the relatively expensive tri-basic lead maleate. The qualitative effect of an antioxidant on "Hypalon" weathering is shown in Figure 5 (Table 4).

[5] V. W. Fox, J. G. Hendricks, H. J. Ratti, *Ind. Eng. Chem.*, 41, 1774 (1949).



0 (2 PHR.) ANTIOXIDANT

Fig. 5. Effect of phenolic antioxidant (*right*) in tri-basic lead maleate "Hypalon" compound on one-year Florida exposure (magnification 10X)

TABLE 4. TRI-BASIC LEAD MALEATE "HYPALON" COMPOUND CONTAINING PHENOLIC ANTIOXIDANT

| | | |
|---|---|---|
| "Hypalon" 20 | 100 | 100 |
| Hydrogenated wood rosin* | 2.5 | 2.5 |
| Tri-basic lead maleate† | 25 | 25 |
| Titanium dioxide (Ti-Pure R-510) | 35 | 35 |
| Calcium carbonate (Atomite Whiting) | 25 | 25 |
| Cadmium stearate | 2 | 2 |
| Mercaptobenzothiazole‡ | 2 | 2 |
| Hindered phenol antioxidant§ | — | 2 |

Cure: 30′/307° F.

* Staybelite Resin, Hercules Powder Co., Wilmington.
† Tri-Mal, National Lead Co., New York.
‡ MBT, Du Pont.
§ Zalba, Du Pont.

## Color Pigments

Earlier workers[2,6] have shown that "Hypalon" requires color pigments in order to obtain maximum weather resistance. Unpigmented compounds undergo relatively severe surface and color changes during exposure. The magnitude of the difference between pigmented and unpigmented "Hypalon" compounds is illustrated in Figure 6 (Table 5). The unpigmented "Hypalon" compound undergoes objectionable surface deterioration and color change during one year of Florida aging; while a similar compound containing the required amount of color pigment does not show a significant change in either color or surface after four years. The stability of the pigmented compound is attributable to two basic characteristics of the color pigment, in this case, phthalocyanine blue. First, the color pigment has protected the surface of the compound against color change and surface crazing by screening out ultraviolet radiation, and, secondly, it has maintained its color during exposure time.

In order to protect a "Hypalon" compound from the degradative effects of high-energy ultraviolet radiation, it is desirable to select only those color pigments which show a high degree of opacity to ultraviolet radiation. This restricts the penetration of the ultra-

[6] O. H. McCollum, BL Report No. 274, Du Pont elastomer chemicals department (1954).

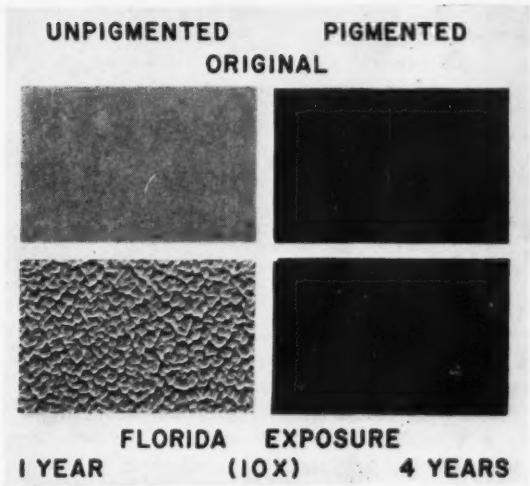



Fig. 6. Comparison of "Hypalon" compounds with and without color pigment on Florida exposure (magnification 10X)

TABLE 5. "HYPALON" COMPOUNDS WITH AND WITHOUT COLOR PIGMENT

| | | |
|---|---|---|
| "Hypalon" 20 | 100 | 100 |
| Hydrogenated wood rosin (Staybelite Resin) | — | 2.5 |
| Litharge | 20 | 25 |
| Calcium carbonate (Atomite Whiting) | — | 50 |
| Phthalocyanine blue* | — | 3 |
| Cadmium stearate | — | 2 |
| Mercaptobenzothiazole (MBT) | — | 2 |
| Benzothiazyl disulfide (MBTS) | 0.5 | — |
| Di-pentamethylene thiuram tetrasulfide (Tetrone A) | 2.0 | — |

Cure: 30′/307° F.

* Ramapo Blue FR BP-366-D, Du Pont.

violet radiation and subsequent deterioration to the outer-most surface where it is observed as a loss of gloss rather than crazing. Carbon black approaches the ideal pigment in this respect since it is opaque to ultraviolet light at a thickness of only 0.0006-mm. of pigment as such. All pigments, however, are not so opaque to ultraviolet light as is carbon black. Phthalocyanine blues and greens as well as quinacridone reds approach the opacity of carbon black, but the lighter-color pigments such as titanium dioxide, molybdate orange, and chrome yellow are somewhat more transparent.

Low opacity does not seem to be a characteristic of only the light colors, since ultramarine blue transmits approximately 80% of the ultraviolet light to which it is exposed. The relative ability of titanium dioxide and carbon black to protect a "Hypalon" compound from ultraviolet light is illustrated at low pigment concentration in Figure 7 (Table 6). Titanium dioxide, which is only one-fifth as opaque to ultraviolet light as carbon black at 3655 Angstrom units,

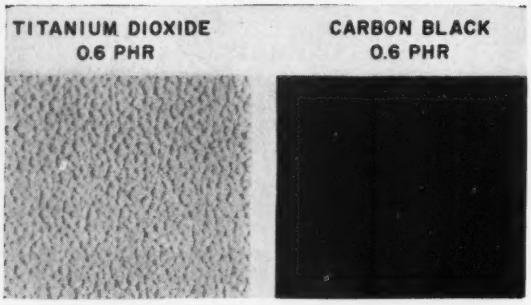



**Fig. 7. Effect of titanium dioxide and carbon black pigment opacities at low concentration in "Hypalon" on three-year exposure in Florida. The titanium dioxide alone is opaque at a thickness of 0.0031-mm., the carbon black at a thickness of 0.0006-mm., to light of a wave length of 3655 A.U. (Magnification 10X)**

affords significantly poorer protection of the surface of the compound. This deficiency does not make titanium dioxide a useless pigmenting material; rather, it indicates that the concentration of titanium dioxide must be increased to compensate for its greater transparency. Accordingly, exposure data indicate that 3 phr. of carbon black are required to obtain good weatherability. The required concentration of titanium dioxide would be expected to be greater than that of carbon black by a factor of 5 to compensate for the difference in opacity and by 2.3 to compensate for the difference in specific gravity. This yields a calculated minimum concentration for titanium dioxide of 35 phr., which is in agreement with exposure tests.

The use of measured ultraviolet transmission values as a basis for the selection of pigments for "Hypalon" on a broad scale is not possible because of the limited amount of data available. However, values for several inorganic materials which are of potential importance in "Hypalon" were reported by H. A. Nelson and W. Norris[7] (Table 7). In the absence of ultraviolet transmission data,[7] pigments have been screened by incorporating them into "Hypalon" compounds at various concentrations and exposing these specimens to direct sunlight.

TABLE 6. COMPOUNDS WITH LOW TITANIUM DIOXIDE AND CARBON BLACK CONTENT

| | | |
|---|---|---|
| "Hypalon" S-2 | 100 | 100 |
| Hydrogenated wood rosin (Staybelite Resin) | 2.5 | 2.5 |
| Tri-basic lead maleate (Tri-Mal) | 36 | 36 |
| Calcined clay* | 26 | 26 |
| EPC Carbon Black | 0.6 | — |
| Titanium dioxide† | — | 0.6 |
| Mercaptobenzothiazole (MBT) | 2 | 2 |

Cure: 30'/307° F.

* Iceberg Pigment, Burgess Pigment Co., Sandersville, Ga.
† Ti-Pure R-110, Du Pont pigments department.

These studies provide data regarding the pigment concentration required for surface protection as well as the effectiveness of the pigment as an ultraviolet absorber. Results obtained with phthalocyanine blue are shown in Figure 8 (Table 8). It will be noted that as the concentration of phthalocyanine blue is increased from 0 to 3 phr. retention of surface integrity is much improved, but a further increase to 5 phr. has no additional effect.

The results of similar examinations of other pigments in "Hypalon" are summarized in Table 9. It is expected that if extreme care were taken to insure near perfect dispersion, these concentrations might be reduced slightly. On the other hand, it is possible that after several years' additional exposure similar examination might indicate a need of a slightly higher pigment concentration.

A pigment which protects the surface of a "Hypalon" compound from deterioration during outdoor exposure is of little value unless it also maintains its color. The stability of pigments in elastomers is unfortunately rarely stressed by the pigment manufacturer since most light-colored elastomeric products fail during outdoor aging before objectionable fading of

[7] H. A. Nelson and W. Norris, "Pigments in Nitrocellulose Lacquer Enamels," Research Bulletin, New Jersey Zinc Co., New York, N. Y. (1927).

TABLE 7. TRANSMISSION OF ULTRAVIOLET LIGHT BY PIGMENTS*

| Sample | Composition | % Transmission of Pigment Layer 0.00092-mm. Thick at Wave Lengths 4358 | 4047 | 3655 | 3342 | 3131 | 3023 | Thickness at Which Pigment Is Opaque to 3655 A.U. |
|---|---|---|---|---|---|---|---|---|
| Titanium dioxide | | 35 | 32 | 18 | 6 | .5 | 0 | .0031 = mm. |
| Carbon black | | 0 | 0 | 0 | 0 | 0 | 0 | .0006 |
| Chromium oxide | 98% Chromium oxide | 13 | 12 | 10 | 10 | 10.5 | 11 | .0022 |
| Light green | 6.5 Ferric ferrocyanide, 18.5% lead sulfate, 75% lead chromate | 1.5 | 1.5 | 3.5 | 3.0 | 3.0 | 2.5 | .0012 |
| Chrome yellow | Lead chromate 65%, lead sulfate 35% | 0 | 0 | 0 | 0 | 0 | 0 | .00085 |
| Chrome yellow | 98% Lead chromate | 2.5 | 3 | 4.5 | 4.5 | 4 | 4 | .0015 |
| Light chrome orange | 73% Lead chromate, 27% lead oxide | 4.5 | 4.1 | 5 | 5 | 4.3 | 4.3 | .0017 |
| Iron oxide | 98% Iron oxide | 0 | 0 | .5 | 0 | 0 | 0 | .00095 |

* Nelson and Norris.[7]

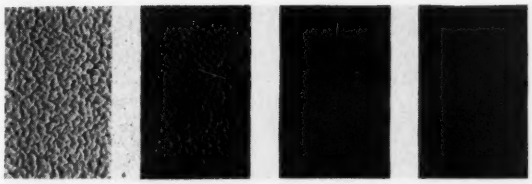



Fig. 8. Effect of phthalocyanine blue content in "Hypalon" compounds on surface aging during two years' exposure in Florida (magnification 10X)

TABLE 8. "HYPALON" COMPOUNDS WITH VARYING PHTHALOCYANINE BLUE CONTENT

| | | | | |
|---|---|---|---|---|
| "Hypalon" 20 | 100 | 100 | 100 | 100 |
| Litharge | 20 | 20 | 20 | 20 |
| Benzothiazyl disulfide (MBTS) | 0.5 | 0.5 | 0.5 | 0.5 |
| Di-pentamethylene thiuram tetrasulfide (Tetrone A) | 2 | 2 | 2 | 2 |
| Phthalocyanine blue (Ramapo Blue FR BP-366-D) | 0 | 1 | 3 | 5 |

Cure: 30′/307° F.

the pigment occurs. The relative stability of pigments in paint vehicles is, however, widely discussed by paint manufacturers. For example, Vesce[8] shows excellent comparisons in the properties of color pigments in paints. The data are of importance in the compounding of "Hypalon" since it is generally found that pigments which are stable in paint vehicles are also stable in "Hypalon" and *vice versa.*

Selection of pigments for pastel shades is much more critical than selection of pigments for mass tones. Since titanium dioxide does not undergo color change, slight fading of the color pigment causes a relatively sharp shift toward white. In mass tones, hiding power is developed solely from the color pigment. Fading of the pigment on the surface due to exposure to light results in a relatively small apparent color change since the unchanged pigment in the interior of the specimen contributes to the total color.

In addition to ultraviolet opacity and color stability bleed resistance and chalk resistance of pigments are important in certain applications. Pigments such as toluidine reds and yellows which show good color stability and adequate ultraviolet light absorption can rarely be tolerated because of their tendency to bleed. Bleed resistance is an essential requirement of pigments used in pastels. Toluidine red—titanium dioxide combinations are pink after cure, but turn red during storage or aging owing to bleeding of the toluidine red.

In cases where pigments such as titanium dioxides are used in large amounts, chalk resistance is important. In pastel shades, where chalking of the titanium dioxide will be observed as a loss of color, it is essential to use a grade of titanium dioxide that is highly chalk resistant. In other applications, a chalking grade is used to obtain a self-cleaning surface.

TABLE 9. PIGMENTS FOR "HYPALON"

| Pigment Type | Color | Supplier | Phr. Required* |
|---|---|---|---|
| Titanium dioxide | White | Du Pont (Ti-Pure) | 35 |
| Lead chromate (monoclinic) | Yellow | Du Pont (chrome yellow) | 6 |
| Nickel Azo | Yellow-green masstone Yellow pastel | Du Pont (green-gold) | 3 |
| Lead chromate (tetragonal) Lead molybdate | Orange | Du Pont (molybdate orange) | 6 |
| Quinacridone | Red and violet | Du Pont (Monastral red and violet) | 3 |
| Phthalocyanine | Blue and green | Du Pont (Monastral blue and green) | 3 |
| Carbon black | Black | | 3 |

* Minimum pigment required for ultraviolet screening based on two-year Florida exposure.

## Fillers

Compared with pigments, fillers such as clay and calcium carbonate are essentially transparent to ultraviolet light.[7] Consequently they effect only a slight improvement in the retention of surface integrity or color of "Hypalon" compounds during outdoor exposure, and their use does not materially reduce the amount of pigment needed for surface protection.

The major difference between fillers, as it is related to the durability of "Hypalon" compounds exposed to the weather, lies in the difference in chalking rate observed among various fillers. Quite contrary to that observed in neoprene,[9] calcium carbonate is an excellent filler for "Hypalon," yielding compounds with maximum weather resistance. Clays tends to chalk in "Hypalon" when as little as 50 phr. are present. Barium sulfate and talc are similar to clay in that they chalk when used at low concentrations. The difference in chalking resistance between these fillers is shown in Figure 9 (Table 10). Whiting did not chalk either at 45 volumes or at 15 volumes; while $BaSO_4$, talc, and clay showed chalking at 15 volumes. In addition to being objectionable from the standpoint of streakiness and apparent color change, chalking ultimately results in a loss of surface and objectionable crazing. Figure 10 (Table 11) shows that this condition has occurred after four years' exposure at 45 degrees south in Florida. In normal service, it is believed that this condition will not be observed for a considerably longer exposure period, and since it is primarily a surface phenomenon, will have little effect on the service life of many end-products. In any case, it appears that the use of calcium carbonate (whiting) will result in improved durability.

[8] Vesce, "Official Digest of the Federation of Paint & Varnish Production Clubs," 31 (1959).
[9] D. C. Thompson, N. L. Catton, *Ind. Eng. Chem.*, 42, 892 (1950).

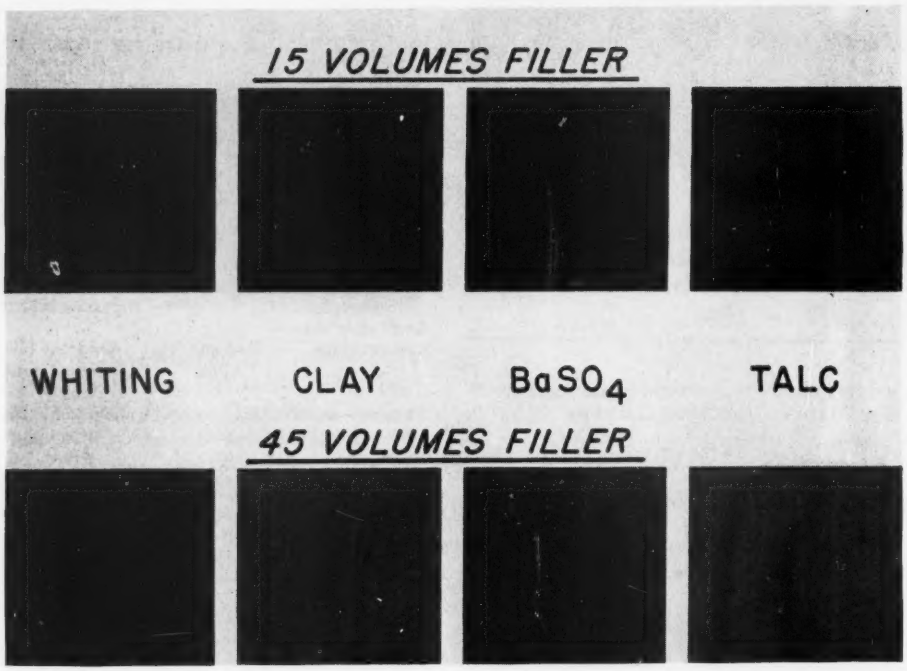



**Fig. 9. Effect of type of filler on chalking of "Hypalon" compounds during two years' of outdoor exposure in the State of Delaware**

TABLE 10. COMPOUNDS WITH VARIOUS FILLERS FOR CHALKING TESTS

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| "Hypalon" 20 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Hydrogenated wood rosin (Staybelite Resin) | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Tri-basic lead maleate (Tri-Mal) | 40 | 40 | 40 | 40 | 40 | 40 | 40 | 40 |
| Phthalocyanine green* | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| Barium sulfate† | 61 (15 vol.) | 184 (45 vol.) | — | — | — | — | — | — |
| Calcium carbonate‡ | — | — | 38 (15 vol.) | 114 (45 vol.) | — | — | — | — |
| Talc | — | — | — | — | 40 (15 vol.) | 120 (45 vol.) | — | — |
| Hard clay§ | — | — | — | — | — | — | 37 (15 vol.) | 110 (45 vol.) |
| Diorthotolyl guanidine¶ | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 2-Mercaptoimidazoline‖ | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Butanol | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Mineral spirits | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Toluene | 243 | 243 | 243 | 243 | 243 | 243 | 243 | 243 |
| Xylene | 95 | 95 | 95 | 95 | 95 | 95 | 95 | 95 |

Applied to Steel Panels and Exposed Uncured.

* Green GT-751-D, Du Pont.
† Blanc Fixe, Whittaker, Clark & Daniels, Inc., New York.
‡ York Whiting, National Gypsum Co., Buffalo, N. Y.; R. E. Carroll, Inc., Trenton, N. J., distributor.
§ Suprex Clay, J. M. Huber Corp., New York.
¶ DOTG, Du Pont.
‖ NA-22, Du Pont.

## Predicted Life of "Hypalon" Compounds

In the four years that "Hypalon" compounds have been exposed under controlled conditions, vulcanizates compounded for weather resistance have not shown signs of failure. Based on these relatively short exposures, predictions regarding the ultimate life of "Hypalon" compounds is somewhat hazardous. It is possible, however, to gain an insight into the life of these compounds by using neoprene as a control. For the purpose of comparison, we have selected the aging curves of black neoprene telephone drop wire-jacket

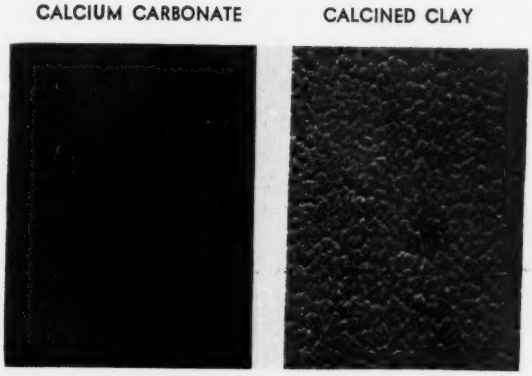



Fig. 10. Effect of four years' Florida exposure on "Hypalon" compounds containing 50 phr. whiting and calcined clay (magnification 10X)

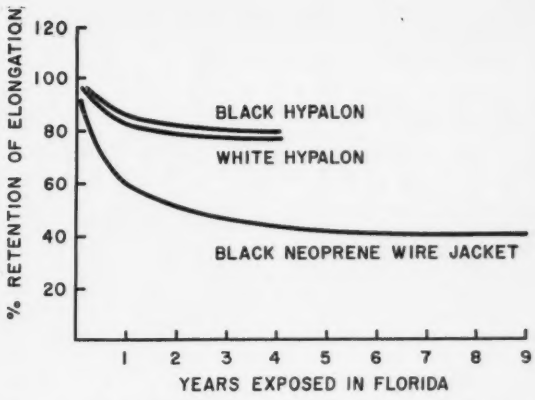



Fig. 11. Retention of elongation of "Hypalon" and neoprene compounds on exposure in Florida

TABLE 11. COMPOUNDS CONTAINING WHITING AND CALCINED CLAY (CURE: 30'/307° F.)

| | | |
|---|---|---|
| "Hypalon" S-2 | 100 | 100 |
| Hydrogenated wood rosin (Staybelite Resin) | 2.5 | 2.5 |
| Litharge | 25 | 25 |
| Calcium carbonate (Atomite Whiting) | 50 | — |
| Calcined clay (Iceberg Pigment) | — | 50 |
| Cadmium stearate | 2 | 2 |
| Phthalocyanine blue (Ramapo Blue FR BP-366-D) | 1.5 | 1.5 |
| Mercaptobenzothiazole (MBT) | 2 | 2 |

TABLE 12. WHITE AND BLACK "HYPALON" COMPOUNDS FOR ELONGATION RETENTION TESTS

| | | |
|---|---|---|
| "Hypalon" S-2 | 100 | 100 |
| Hydrogenated wood rosin (Staybelite Resin) | 2.5 | 2.5 |
| Litharge | 25 | 20 |
| SRF Carbon Black | — | 75 |
| Titanium dioxide (Ti-Pure R-610) | 50 | — |
| Aromatic process oil* | — | 35 |
| Cadmium stearate | 2 | — |
| Mercaptobenzothiazole (MBT) | 2 | — |
| Benzothiazyl disulfide (MBTS) | — | 0.5 |
| Di-pentamethylene thiuram tetrasulfide (Tetrone A) | — | 0.75 |

Cure: 30'/307° F.

* Sundex 53, Sun Oil Co., Philadelphia, Pa.

compounds reported by G. N. Vacca *et al.*[10,11] Although Vacca shows only nine-year exposure data, similar compounds are reported to be mechanically useful after 15 years, with a potential life of at least 20.

A comparison of the retention of elongation of the neoprene compound with that of the black and the white "Hypalon" compounds in Figure 11 (Table 12) shows that both of the "Hypalon" compounds level off at after a much smaller elongation loss than does the neoprene compound. Further, the slope of the "Hypalon" aging curve is equivalent to that of the neoprene curve, indicating that the "Hypalon" compounds will continue to be superior to the neoprene compound during further exposure. This relation would also be predicted from comparative heat aging tests. Thus the useful life of the "Hypalon" compounds may well exceed twice that of the neoprene compound.

## Summary and Conclusions

The exposure life of "Hypalon" vulcanizates compounded for maximum weather resistance appears to exceed that of neoprene compounds. Exposure tests indicate, however, that maximum stability will be realized only with the proper selection of color pigments, fillers, curing system, and type of "Hypalon."

Comparison of different types of chlorosulfonated polyethylenes indicates that weather resistance increases in the following order: "Hypalon" 30 < "Hypalon" 20 < "Hypalon" 40. It is felt that these differences would be significant only after long-term exposure.

Compounds containing high concentrations of magnesia were found to harden rapidly during exposure. This problem was overcome with curing systems based on a small amount of magnesia in combination with pentaerythritol or epoxy resin.

The surface crazing of compounds vulcanized with 25 phr. of tri-basic lead maleate appears to be due to oxidation. This problem was solved by increasing the tri-basic lead maleate concentration to 40 phr. or by adding a phenolic antioxidant.

Color pigments which absorb ultraviolet light have been shown to protect the surface of "Hypalon" compounds from crazing during exposure. Variations in ultraviolet light absorption ability among color pigments may be compensated for by adjusting the pigment concentration in the compound.

"Hypalon" compounds containing calcium carbonate resist chalking when they contain 45 volumes of this filler. Other mineral fillers tested chalk at 15 volumes and produce crazing during long exposure.

[10] G. N. Vacca, R. H. Erickson, C. V. Lundberg, *Ind. Eng. Chem.*, 43, 443 (1951).
[11] Jahn, Vacca, *Wire & Wire Products*, 33, 1178 (1958).

# New Tire Plant Utilizes Automation

Mansfield Tire plant in Mississippi makes use of modern design in building layout and equipment

MEETING the demands for tires from both the automobile industry and the replacement market has forced the tire manufacturers to seek highly automated production facilities to offset rising costs and provide consumer savings. The best possible way to achieve the ultimate in an automated plant is to design and build a plant from scratch. Needing an outlet in the Mississippi area, the Mansfield Tire & Rubber Co. has done just that and has created a wholly owned subsidiary, Pennsylvania Tire & Rubber Co. of Mississippi, Inc., which has built and is now operating a highly efficient, automatic, and compact production line plant at Tupelo, Miss.

This $2-million plant employs about 110 people and produces about 1,500 tires per day, with automatic controls using gamma rays and other electronic methods insuring high standards of quality with precision accuracy.

The efficient design started with the building itself. Constructed of brick, steel, and concrete, the one-floor plan allows all machinery—from mixing and milling through calendering, tread making, bead assembly, and tire building to curing and inspection—to be installed in a compact conveyorized sequence for maximum efficiency.

Following the well-regulated mixing and other preparatory steps, automatic tire building machines assemble a green tire at the rate of one tire in less than two minutes for each machine. The tire's three principal components—the ply fabric, the bead, and the tread structure—are brought together from separate preparation lines, and once the stock is started on the building drum, the machine automatically stitches the plies together, locks in the wire bead, and tightly caps the carcass with tread and sidewall rubber.

The next step consists of an installation entirely new to the industry. An automatic green tire dispatching system which picks up uncured tires—racks of 32 in one lift—moves them to the loading magazines of the automatic curing presses and distributes them to the proper curing stations, all from push-button control. The dispatcher also conveys the emptied racks to the sorting area for reloading.

The plant's new curing presses are fully automatic, requiring a minimum of manual attention from the time the green tires are delivered by the dispatcher until they are ejected to a conveyor, fully vulcanized. The loading magazine drops the green tire into the already self-cleaned and self-lubricated mold. As the press closes, a steam-inflated bladder shapes the tire into proper form and properly seats it in the mold for the curing cycle.

Automatic devices again take over to open the press, deflate the curing bladder, move the cured tire to a post-cure inflation station (a new feature to prevent so-called "growth" of the tire in use), deflates the tire when cool, and then moves it to a carry-away conveyor to final finishing and painting machines.

Dedication ceremonies for this new modern plant were held only last April 21, and already plans are being made for management's serious consideration of immediate expansion due to strong customer demands in the area served by this plant. Company officials described Tupelo as a fine, progressive city geographi-

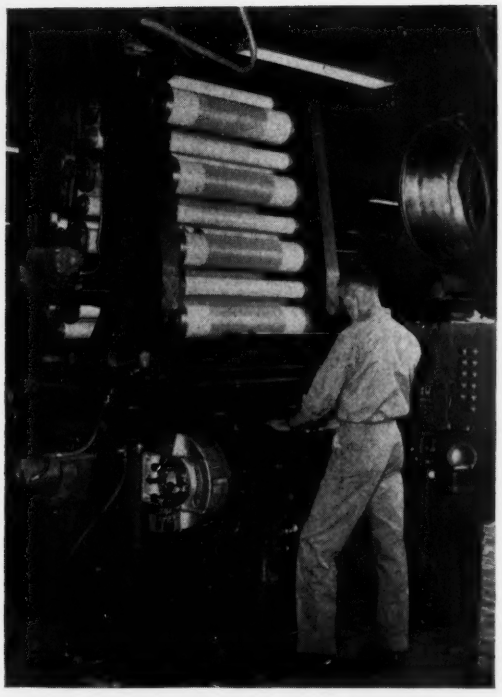
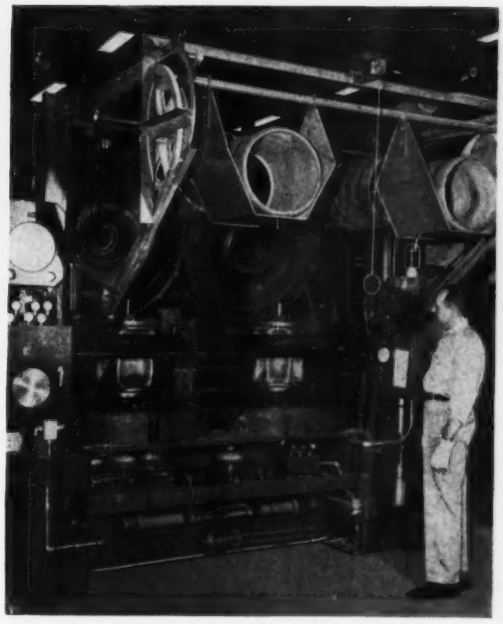


**Fig. 1. Automatic tire building machine. Finished green tire is shown on conveyor *(upper right)* on its way to curing press**

cally ideal for better serving their existing customers as well as new customers.

While tire production lends itself particularly well to automation, and much effort has gone into design of machinery and equipment for making tires, there is much in the design and planning of this new plant which may well be adapted to layouts of new plants in other segments of the rubber industry. The one-floor design with offices on a second-floor mezzanine and machinery plans allowing for continuous flow of materials and parts from raw material receiving through the plant to finished goods and shipping are sound design principles for any type of manufacturing activity in the rubber field.

**Fig. 2. Close-up of curing press. Green tires *(top)* are automatically dropped into self-cleaned and lubricated mold. Cured tires *(center)* are ejected on to conveyor for further processing**



## Boilers Offered On Lease, Installment Plans

Boiler users who normally purchase their new boilers outright now have the option of leasing them or buying them through installment payments under plans announced by the Boiler Engineering & Supply Co., Phoenixville, Pa., maker of Continental automatic package boilers of 15 to 600 hp. for industrial, commercial, and institutional service.

Under the leasing plan, the user firm can make options to purchase the equipment after lengths of time which vary according to the age and types of boilers. After the primary term, options can be continued at a yearly cost of slightly more than the original monthly payments, Boiler Engineering says.

Under the other plan, boilers may be bought with a down payment of 20% and the balance payable in 12 to 36 monthly payments with annual interest at 6½%.

The announcement notes that both plans conserve working capital and credit for other purposes such as expansion, and that the leasing plan has definite tax advantages. Lease payments are made out of before-tax earnings, not after-tax profits, and are fully tax-deductible as operating expense items, eliminating the problem of capitalizing the boiler and depreciating it year by year over its life.

The company also argues that the leasing plan provides two hedges against inflation, since it eliminates the inflationary loss which occurs when equipment is purchased outright and the value of the dollar declines, and at the same time provides that rising prices will mean that payments will be made in "cheaper" dollars. There are no chattel mortgages or conditional sales contracts necessary under the leasing plan.

Rubber Division, ACS,

# New York Program Most Successful; Goodyear Medalist, Officers Chosen

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**H. A. Winkelmann, 1961 Goodyear medalist, receiving congratulations of E. H. Krismann, chairman of Goodyear Award Committee**

New polymers and polymerization methods, elastomer reinforcement, rubber chemistry and compounding, and new test methods were featured in the papers[1] presented before the seventy-eighth meeting of the Division of Rubber Chemistry, ACS, held at the Commodore Hotel in New York, N. Y., September 14-16, as a part of the meeting of the parent Society.

The Division selected H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., as its 1961 Charles Goodyear medalist. W. S. Coe, Naugatuck Chemical Division, United States Rubber Co., became the new Division chairman; while G. E. Popp, Phillips Chemical Co., who retired as Division treasurer, was elected vice chairman. R. H. Gerke, U. S. Rubber, retired as Division secretary, and L. H. Howland, Naugatuck Chemical, was elected to replace him. D. H. Behney, Harwick Standard Chemical Co., was elected treasurer.

The local committee on arrangements for the New York meeting was headed by E. S. Kern, R. T. Vanderbilt Co., and H. Peters, Bell Telephone Laboratories, as co-chairmen and they and their committee deserve much credit for their part in making the meeting a success.

W. J. Sparks, Esso Research & Engineering Co., 1960 Division chairman, presided at the first technical session on the afternoon of September 14. He mentioned that he was in charge of a joint symposium of the Divisions of Rubber Chemistry and of Petroleum Chemistry on new synthetic rubbers from petroleum to be held in 1961 and asked for papers for presentation at this symposium.

Dr. Sparks stated that one of his projects as chairman of the Rubber Division in 1960 had been to foster relations with academic workers on polymers and elastomers and that the papers to be presented by Maurice Morton, University of Akron, and C. S. Marvel, University of Illinois, at the New York meeting were a part of that project.

## Highlights of Technical Sessions

The latest developments in anionic polymerization, which has the outstanding features of stereospecificity and absence of chain termination and thus has made possible the synthesis of polymers of regulated and controlled molecular weight distribution, were reviewed in an invited paper by Dr. Morton. Ethylene-propylene rubber was shown to have outstanding ozone and weathering resistance and excellent wear resistance, and although processing and curing procedures were indicated as being somewhat less satisfactory at present than those for large-volume commercial elastomers, EPR should be useful eventually in a wide range of tire and non-tire products, according to L. O. Amberg and A. E. Robinson, of Hercules Powder Co.

The development of a non-flammable elastomer with many other properties of value for military applications was reported by J. C. Montermoso and co-workers at the Quartermaster Research & Engineering Center and G. H. Crawford, Minnesota Mining & Mfg. Co. The effect of several different isocyanates on the structure of urethane elastomers was detailed by C. F. Blaich, Jr., and A. J. Sampson, of Carwin Co.; the low-temperature behavior of the several neoprenes was explained by R. M. Murray and J. D. Detenber, of Du Pont's elastomer chemicals department; and the mechanism of the reactions of magnesium oxides in chlorobutyl rubber was described by W. H. Deis and L. F. Heneghan, of Merck's Marine Magnesium Division, in other papers.

In the symposium on elastomer reinforcement, the latest in equipment and techniques in electron microscopy were explained in a paper by W. A. and M. W. Ladd, of Ladd Research Industries, Inc. Carbon blacks of various structure levels were compared as to their effects on tire tread wear by T. D. Bolt and E. M. Dannenberg, of Godfrey L. Cabot, Inc., and the new low-

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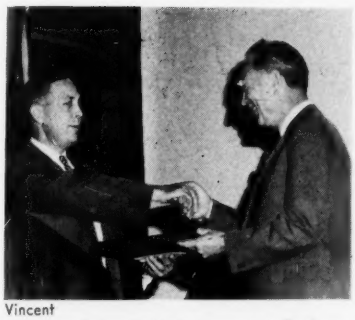
**Chairman W. S. Sparks presiding at New York meeting**

[1] For abstracts see RUBBER WORLD, July, 1960, pp. 86-96.



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**Dr. Sparks receiving congratulations and scroll from Dr. Coe**

structure blacks were shown to equal ISAF blacks except when the former were used in lower than normal amounts and under conditions of high rates of tread wear.

In connection with oxygen volatiles on carbon black, neither the kind nor the amount down to substantially zero has significant effects on elastomer reinforcement, according to C. W. Sweitzer and others at Columbian Carbon Co. Reinforcement is only drastically reduced when the surface underlying the oxygen functional groups is rearranged, he added. New information on peroxide and radiation-cured rubber compounds containing reinforcing fine particle silica was presented by J. W. Sellers and coworkers at Columbia-Southern Chemical Co. In another paper, A. M. Gessler, Esso Research, provided more details on his continuing work with attrited carbon blacks. Mixtures of ultrafine talc and reinforcing furnace blacks show improved stress-strain properties in SBR 1500 over those obtained with furnace blacks alone, according to M. F. Warner, of Sierra Talc Co.

A new laboratory abrasion test, which has provided a good differentiation of unknown tire tread stocks in the laboratory and good correlation with road test results, was described by E. B. Newton, of The B. F. Goodrich Co.

Although research in progress is pointing the way toward new heat-stable structures, the two best types of rubbers available for high-temperature service at present are the silicone rubbers and the fluorocarbon rubbers, C. S. Marvel, of the University of Illinois, said in his invited paper of high-temperature rubbers. Dr. Marvel reported on rubbery polymers prepared by the joint hydrolysis of dimethyl silicone dichloride and dimethyl germanium bromide, and on other silicone rubbers with good properties at high temperature that had been developed by Russian workers. Work on polyfluoroamidines by H. C. Brown and coworkers at the University of Florida and work on a reaction to yield products with alternate phenyl and thiazole units and on polymeric isophthalic bisthioamide, by J. E. Mulvaney and C. S. Marvel, at the University of Illinois, were mentioned also.

A new apparatus which provides a progressive measure of modulus change during cure or reversion through the change in deformation of a periodically loaded plunger, one end of which is embedded in the specimen, was described in a paper by F. S. Conant and coworkers at the Firestone Tire & Rubber Co.

Some interesting results on a study of vulcanization systems for blends of chlorobutyl rubber with other elastomers were reported by G. J. Ziarnik and others at Esso Research. Although the major emphasis was on chlorobutyl-natural rubber blends, results with blends of chlorobutyl with neoprene, SBR, NBR, polybutadiene, and whole-tire reclaim were also given. The cross-linking efficiency of dicumyl peroxides in carbon black-reinforced SBR 1500 and natural rubber compounds was the subject of a paper by M. L. Studebaker and L. G. Nabors, of Phillips Chemical Co. The use of selenium and selenium compounds in rubber compounds was described by W. J. Mueller and S. Palinchak, of Battelle Memorial Institute.

Dynamic properties of elastomers can be measured over a broad range of frequencies, temperatures, and strain levels, using short-time relaxation data on samples stressed at very high speeds, instead of complex mechanical equipment and measuring devices, according to R. M. Cardillo and W. W. Gleason, of Enjay Chemical Co. An interesting comparison between the use of the two-roll mill and the dough mixer for compounding silicone rubber was given by A. O. Liermann and D. E. Miller, silicone products department, General Electric Co.

A comprehensive study of the use of 1,1′-azobisformamides as blowing agents for SBR, butyl, neoprene, and nitrile rubbers and for polyvinyl chloride and polyethylene was presented in a paper by H. A. Hill and H. R. Lasman, of National Polychemicals, Inc. The heat aging and other properties of butyl rubber insulation loaded with clay, in which various polyolefins such as polyethylene were incorporated, were explained by F. Rodriquez and C. C. Winding, of Cornell University.

Some interesting information on new compounds of chlorobutyl rubber with other elastomers for tubeless-tire inner-liners was given by J. V. Fusco and R. H. Dudley, of Enjay Chemical.

## Business Meeting

At the business meeting on the morning of September 15, at which Chairman Sparks presided, the Best Paper Award for the Division's May, 1960, Buffalo, N. Y., meeting was made to W. A. Smith and J. M. Willis, Firestone Tire & Rubber, for their paper, "Diene Rubber—Compounding and Testing."

E. H. Krismann, Du Pont elastomer chemicals department, most recent past chairman of the Division and chairman

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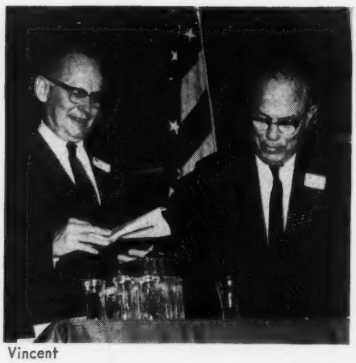
**Past and present Division officers, *left to right:* R. H. Gerke, 1960 secretary; D. F. Behney, 1961 treasurer; W. S. Sparks, 1960 chairman; W. S. Coe, 1961 chairman; and L. H. Howland, 1961 secretary**

of the Charles Goodyear Medal Award Committee, announced that H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., had been selected as the Division's 1961 recipient of the Goodyear Medal Award. Congratulations and a standing ovation for Dr. Winkelmann were extended to him by the members present at the time of this announcement.

The results of the election of officers and directors from the areas of certain of the local rubber groups were announced by A. C. Stevenson, Du Pont. The new officers are as follows: chairman. W. S. Coe, Naugatuck Chemical Division; vice chairman, G. E. Popp, Phillips Chemical Co.; secretary, L. H. Howland, Naugatuck Chemical; treasurer, D. F. Behney, Harwick Standard Chemical Co.; and director-at-large, H. J. Osterhof, Goodyear Tire & Rubber Co.

Directors and alternates from the areas served by the rubber groups indicated will be: *Akron,* M. H. Leonard, Columbian Carbon Co., and I. G. Sjothun, Firestone; *Boston,* G. W. Smith, Du Pont, and W. F. Malcolm, Titanium Pigment Corp.; *Buffalo,* J. Helwic, Dunlop Tire & Rubber Co. (Mr. Helwic has moved from the area; so cannot serve), and J. Frankfurth, U. S. Rubber Reclaiming Co.; *Canada,* J. A. Carr, Dunlop Canada, Ltd., and T. L. Davies, Polymer Corp., Ltd.; *Los Angeles,* D. C. Maddy, Harwick Standard Chemical, and A. J. Hawkins, Jr., Du Pont; and *New York,* C. V. Lundberg, Bell Telephone Laboratories, and J. T. Dunn, Thiokol Chemical Corp.

R. H. Gerke, U. S. Rubber, Division secretary, announced that he had been notified that the Council of the parent Society had made some changes in the by-laws of the Division to bring them in line with the by-laws of the Society, and that these changes required approval by a vote of the membership of the Division. These changes were read and dealt with such things as the wording regarding associate membership dues, emeritus members, the fact that councilors and alternate councilors must be elected, not appointed, and the duties of the nominating committee. The membership voted approval of the changes.



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**R. G. Seaman, *left,* and L. H. Howland, Division secretary**

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**R. S. Walker congratulating retiring secretary R. H. Gerke**

Chairman Sparks asked the members to stand and observe a moment of silence for M. Buffington, consultant, and D. F. Fraser, Garlock, Inc., members whose deaths had occurred since the last meeting of the Division.

The chairman also reported on those members who had achieved emeritus status and stated that they were same as given at the May meeting in Buffalo.[2]

Dr. Sparks paid tribute to Dr. Gerke, who retired as secretary of the Division, and to G. E. Popp, Phillips Chemical, who retired as treasurer with the New York meeting, and these officers received scrolls in recognition of their services.

Dr. Coe, the new Division chairman, then paid tribute to the work of Dr. Sparks as 1960 chairman of the Division and presented him with a scroll commemorating his services.

The members were reminded that the next meeting of the Rubber Division will be held in Louisville, Ky., April 18-21, 1961, and the deadline for abstracts of papers for this meeting to be sent to Division Secretary L. H. Howland, Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., is February 20, 1961.

Since there was no new business to come before the Division, the meeting was adjourned.

## 25-Year Club Luncheon Meeting

The regular meeting of the 25-Year Club of the Division was held on September 14, with about 200 members present. John Ball, Midwest Rubber Reclaiming Co., was chairman for the meeting of what he called "the most important group in the entire rubber industry with members from all over the North American Continent."

New members of the Club were asked to stand and identify themselves; then Mr. Ball advised them of the fact that membership involved many advantages and no duties.

Mr. Ball introduced Dr. Winkelmann, the permanent chairman of the Club, and mentioned that E. B. Busenberg, B. F. Goodrich Co., the secretary could not attend the New York meeting, but that J. A. Breckley, Titanium Pigment Corp., was acting as Mr. Busenberg's deputy. New members were asked to give their names to Mr. Breckley and to contact Owen Brown, Godrey L. Cabot, Inc., for their 25-Year Club pins.

Cocktails preceding the Club luncheon were supplied by courtesy of the suppliers' committee, and Mr. Ball thanked M. E. Lerner, *Rubber Age,* chairman of that committee, in behalf of the membership.

Mr. Ball introduced next a number

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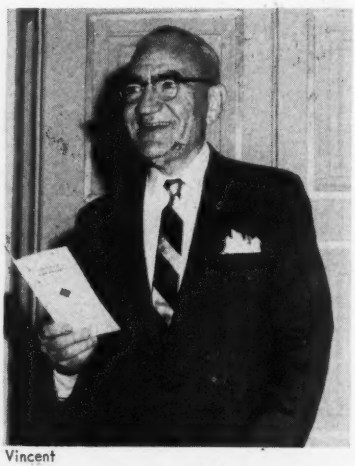
**H. Peters, co-chairman local arrangements committee**



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**J. Ball, 25-Year Club New York meeting chairman**

[2] RUBBER WORLD, June, 1960, p. 110.

of people present at the meeting who had been important in Rubber Division activities over the years as officers or had received the Goodyear Medal Award or had been active in other capacities. Included in this group were F. H. Banbury, Medalist; S. G. Byam, past chairman; C. W. Christensen, past secretary; R. F. Dunbrook and B. S. Garvey, past chairmen; C. R. Haynes, past secretary; A. E. Juve and A. R. Kemp, past chairmen; A. Oakleaf and G. E. Popp, past treasurers; R. G. Seaman, committeeman; L. B. Sebrell, Medalist and past chairman; and N. S. Shepard, past chairman. In addition, Mr. Ball mentioned that many members of the Club sent telegrams of regrets that they could not attend the New York meeting.

Those present were asked to stand and observe a moment of silence in memory of M. Buffington and D. C. Fraser, who had passed away since the last meeting of the Club.

Dr. Winkelmann conducted the traditional elimination contest for the member present with the longest record of service in the rubber industry, and this contest was won by C. E. Bauer, of Hercules Tire & Rubber Co., who reported 54 years of service with the industry.

Dr. Winkelmann announced that the chairman for the next meeting of the Club in Louisville in April would be H. O. George, of American Synthetic Rubber Corp.

## Committee D-11 Assigns English SBR Number

Committee D-11 on Rubber and Rubber-Like Materials of the American Society for Testing Materials, through Subcommittee 13 on Synthetic Elastomers, has assigned the number 1570 to a high-viscosity SBR copolymer at the request of International Synthetic Rubber Co., Ltd., Southampton, England.

DESCRIPTION OF TYPES OF STYRENE-BUTADIENE (SBR) ELASTOMERS, ASSIGNMENT OF NEW CODE NUMBERS—ASTM D-11 1419-56T

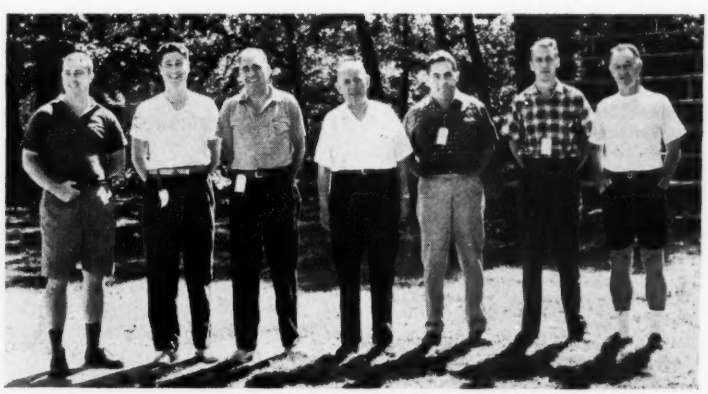
| | |
|---|---|
| Number as assigned | 1570 |
| Date assigned | Sept. 11, 1960 |
| Distinctive feature | High viscosity |
| Type | 1500 |
| Nominal temp., °F. | 42 |
| Activator | FRA |
| Shortstop | ND |
| Antioxidant | NST |
| Catalyst | OHP |
| Emulsifier | Mixed |
| Nominal bound styrene, % | 23.5 |
| Conversion, % | 60 |
| Mooney viscosity, ML 1+4 (212° F.)—polymer | 125 |
| MS 1+4 (212° F.)—compound | 78 |
| Coagulation | SA |
| Finishing | Normal |

Note: Abbreviations and symbols are defined as follows:
FRA = free radical type, i.e., iron-pyrophosphate, peroxamine sulfoxylate.
ND = non-discoloring.
NST = non-staining.
OHP = organic hydroperoxide.
SA = salt acid.

## Connecticut Outing

A total of 185 members attended the outing of the Connecticut Rubber Group at Grassy Hill Park, Derby, Conn., on September 10. E. Schwartz was outing chairman.

The New Haven team won the softball game, and W. S. Taylor and T. Mulcahy won the bocci contest. Other winners included: B. Carlson and H. Beetle, in egg throwing; R. Ekwall, low gross, and J. Stiff, low net, in golf; C. Wilson, H. Fishman, J. Stott, B. Adamson, C. Holstein, and J. Nemeth, in softball; and F. Horvath in the horseshoe singles, and A. Merritt and R. Potter in the doubles.



Members of the committee attending the outing of the Connecticut Rubber Group were, *left to right*, P. Virtue, R. Ward, F. Villa, E. Schwartz, H. Gordon, J. Mitchell, and G. Sprague

Arthur I. Ross

## A. I. Ross Joins RW Editorial Board

Arthur I. Ross, chief chemist, heel and sole division, American Biltrite-Rubber Co., Chelsea, Mass., has joined the Editorial Advisory Board of RUBBER WORLD. Mr. Ross, who replaces the late Walter S. Edsall, will advise the editors in connection with the technology and other matters in the heel and sole branch of the rubber industry.

Mr. Ross received his B.Ch.E. degree from Northeastern University in 1926. He had worked at American Biltrite from 1919 until 1926, prior to receiving his degree. In 1928 the new Board member was made chief chemist of the heel and sole division.

Mr. Ross belongs to the American Chemical Society and its Division of Rubber Chemistry, and to the American Society for Testing Materials. He is also a member and past chairman of the Boston Rubber Group and a member and chairman of the Heel and Sole Technical Committee of The Rubber Manufacturers Association, Inc., and a member of the Shoe Products Committee of the Society of the Plastics Industry.

## Rubber Technology Courses Offered

Courses in elastomer technology are being given by the Akron Polymer Lecture Group; Sinclair College, Dayton, O., and the Chicago Rubber Group. A description of courses follows:

Lectures sponsored by the Akron Polymer Lecture Group are being given under the auspices of the University of Akron; they began July 21 and run through May 5. Lectures include: "Kinetics of Isotactic Polymerization

of Styrene"; "Kinetics of Low-Temperature Polymerization of Isobutene and of Styrene"; "Effect of Oxygen on Vulcanized Rubber"; "Single Crystals and Folding of Macromolecules"; Application of Differential Thermal Analysis to High Polymers"; "Some Aspects of Anionic Polymerizations"; "Thermal Decomposition of Unsaturated Materials"; "Nuclear Magnetic Resonance and the Stereochemistry of Polymer Chains"; "Polymerization by Oxidative Coupling."

The course given by Sinclair College, with the cooperation of the Southern Ohio Rubber Group, running for 16 weeks beginning September 21, is open to persons with a degree in chemistry or other engineering or a semester in organic chemistry, or five years' technical experience with elastomeric materials. This course includes the history and summary of rubber technology; introduction to polymer chemistry; processing of natural and reclaim rubber; vulcanizing of elastomers, including discussion of additives; synthetic elastomers; and manufacturing and testing.

The Chicago Rubber Group course, in basic compounding, runs from October 4 to April 4, and covers compounding ingredients, synthetics, reclaim rubber, and special application compounding from both polymer and ingredient standpoint.

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Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

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The Los Angeles Rubber Group, Inc.

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Rhode Island Rubber Club. Pawtucket Country Club, Pawtucket, R. I.

November 4
The Philadelphia Rubber Group. Fall Dance. Manufacturer's Country Club, Oreland, Pa.

November 7-9
Chemical Institute of Canada. Canadian Chemical Engineering Conference. Quebec, P.Q., Canada.

November 10
Northern California Rubber Group.

November 17
The Rubber Manufacturers Association, Inc. Annual Meeting, New York, N. Y.

November 18
Connecticut Rubber Group. Rapp's Paradise Inn, Ansonia, Conn.
Chicago Rubber Group.

November 22
Manufacturing Chemists' Association. Tenth Semi-Annual Meeting and Midyear Conference. Statler-Hilton Hotel, New York, N. Y.

November 25
Rubber Chemical Salesmen's Association of Akron. University Club of Akron, Akron, O.

November 30-December 1-2
U. S. Army Signal Research & Development Laboratory. Ninth Annual Symposium on "Technical Progress in Communication Wires and Cables." Berkeley-Carteret Hotel, Asbury Park, N. J.

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Boston Rubber Group. Christmas Party. Somerset Hotel, Boston, Mass.

January 20-21
Southern Rubber Group. Statler Hilton Hotel, Dallas, Tex.

January 27
Akron Rubber Group.
Chicago Rubber Group.

February 7
The Los Angeles Rubber Group, Inc.

February 17
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May 21
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June 8
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# washington report

By JOHN F. KING

# FDA Issues List Including Elastomers and Ingredients Exempt from 1958 Laws

The Food & Drug Administration on September 1 issued a list of rubber compounds and ingredients used in the food industry which are exempt from the sanctions of 1958 food additive law.

The exemption, good only until March 6, 1961, was granted on condition that "a minimum quantity" of the listed materials will be incorporated with food, "consistent with good manufacturing practice." It follows an exemption for a list of rubber products used in food packaging which was announced earlier in August.

FDA has been granting exemptions from the 1958 additive amendment, which was originally due to go into effect last March 5, to give manufacturers, including rubber manufacturers, time to develop data showing that use of their products in the food processing industry is not an "undue risk to the public health."

The rubber industry, working through The Rubber Manufacturers Association, Inc., compiled a list of raw materials, used in products such as belt, hose, packing, O-rings, oil seals, molded and extruded goods, and coated fabrics, and submitted it to FDA for official approval or extension of time for further analyses. Under the law the manufacturer bears the burden of proof in showing that his product, when it comes into contact with food, does not transfer harmful substances to the food.

The additives amendment provides that without specific FDA approval, use of any of these rubber products in the food industry can bring seizure.

In issuing the September 1 list of substances "migrating" from rubber and rubber products used in food handling, FDA did not include all the substances listed by the RMA additives committee. Those not on the exempt list are still being studied, FDA said.

Following is the list of exempt elastomers, vulcanization materials, accelerators, retarders, activators, protective agents, plasticizers, fillers, colors, lubricants, and miscellaneous ingredients that was issued September 1.

(f) *Substances migrating from rubber and rubber products used in food handling.* The following additives may be used in rubber and rubber products used in food handling under the condition that a minimum quantity of the additive from the rubber and rubber products will be incorporated in the food, consistent with good manufacturing practice:

(1) *Elastomers.* (i) Natural rubber.

(ii) Styrene-butadiene polymer with stabilizers and/or antioxidants listed in subparagraphs (3) and (4) of this paragraph.

(iii) Chloroprene polymers with stabilizers and/or antioxidants listed in subparagraphs (3) and (4) of this paragraph.

(iv) Nitrile-butadiene polymers with stabilizers and/or antioxidants listed in subparagraphs (3) and (4) of this paragraph.

(v) Isobutylene-isoprene polymers with stabilizers and/or antioxidants listed in subparagraphs (3) and (4) of this paragraph.

(vi) Silicone polymers with stabilizers and/or antioxidants listed in subparagraphs (3) and (4) of this paragraph.

(2) *Vulcanization materials*—(i) *Vulcanizing agents.*

Sulfur, ground.
Tellurium.

(ii) *Accelerators.*

2-Benzothiazyl-*N*,*N*-diethylthiocarbamylsulfide.
2-Benzothiazyl disulfide.
Benzoyl peroxide.
Bismuth dimethyldithiocarbamate.
*N*-*tert*-Butyl-2-benzothiazole-sulfenamide.
Copper dimethyldithiocarbamate.
*N*-Cyclohexyl-2-benzothiazole sulfenamide.
Dibenzoyl-*p*-quinone dioxime.
Dibenzylamine.
di-*tert*-Butyl peroxide.
2,4-Dichlorobenzoyl peroxide.
Dicumyl peroxide.
2,6-Dimethyl morpholine thiobenzothiazole.
*N*,*N*′-Diorthotolyl guanidine.
Diorthotolyl guanidine salt of pyrocatechol borate.
Dipentamethylene thiuram tetrasulfide.
Diphenylguanidine.
4,4′-Dithiodimorpholine.
Ethylenediamine carbamate.
Hexamethylene tetramine.
2-Mercaptobenzothiazole.
2-Mercaptoimidazoline.
*N*-Oxidiethylene-2-benzothiazole sulfenamide.
*N*-Oxidiethylene-benzothiazole-2-sulfenamide.
Piperidinium pentamethylene-dithiocarbamate
Potassium pentamethylene-dithiocarbamate.
*p*-Quinone dioxime.
Sodium dibutyldithiocarbamate.
Tellurium diethyldithiocarbamate.
Tetrabutyl thiuram monosulfide.
Tetraethyl thiuram disulfide.
Tetramethyl thiuram disulfide.
Tetramethyl thiuram monosulfide.
Triethylene tetramine.
Triethyl-trimethyltriamine.
Triethyl-trimethylenetriamine.
Triphenyl guanidine.
Zinc dibutyldithiocarbamate.
Zinc diethyldithiocarbamate.
Zinc dimethyldithiocarbamate.
Zinc-2-mercaptobenzothiazole.

(iii) *Retarders.*

*N*-Nitroso diphenylamine.
Phthalic anhydride.
Salicylic acid.

(iv) *Activators.*

Calcium hydroxide.
Dibutyl-ammonium oleate.
Diethylamine.
Fatty acid amines, mixed.
Fatty acids.
Hydrated lime.
Lauric acid.
Magnesium carbonate.
Magnesium oxide, light and heavy.
Malic acid.
Sodium acetate.
Soybean lecithin-*p*-triethanolamine.
Stannous chloride.
Stearic acid.
Tall oil fatty acid.
Triethanolamine.
Zinc oxide.
Zinc salt of fatty acids.
Zinc stearate.

(3) *Protective agents*—(i) *Antioxidants and antiozonants.*

2,5-di-*tert*-Amyl hydroquinone.
Butylated hydroxytoluene.
4,4′-Butylidine bis(6-*tert*-butyl-*m*-cresol).
di-*tert*-Butyl-4-methylphenol.
*N*-Cyclohexyl-*N*′-phenyl-phenylenediamine.
*p*,*p*′-Diamine diphenylmethane.
1,2-Dihydro-2,2,4-trimethyl-6-phenylquinoline
1,2-Dihydro-2,2,4-trimethylquinoline, polymerized.
4,4′-Dimethoxy diphenylamine.
Dioctyl phenylenediamine.
Diphenyl ethylenediamine.
*N*,*N*′-Diphenyl-*p*-phenylenediamine.
*N*,*N*′-Disalicylal propylenediamine.
6-Dodecyl-2,2,4-trimethyl-1,2-dihydroquinoline.
6-Ethoxy-1,2-dihydro-2,2,4-trimethylquinoline.
Hydroquinone monobenzyl ether.

of Styrene"; "Kinetics of Low-Temperature Polymerization of Isobutene and of Styrene"; "Effect of Oxygen on Vulcanized Rubber"; "Single Crystals and Folding of Macromolecules"; Application of Differential Thermal Analysis to High Polymers"; "Some Aspects of Anionic Polymerizations"; "Thermal Decomposition of Unsaturated Materials"; "Nuclear Magnetic Resonance and the Stereochemistry of Polymer Chains"; "Polymerization by Oxidative Coupling."

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Hexamethylene tetramine.
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2-Mercaptoimidazoline.
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*N*-Oxidiethylene-benzothiazole-2-sulfenamide.
Piperidinium pentamethylene-dithiocarbamate
Potassium pentamethylene-dithiocarbamate.
*p*-Quinone dioxime.
Sodium dibutyldithiocarbamate.
Tellurium diethyldithiocarbamate.
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Tetraethyl thiuram disulfide.
Tetramethyl thiuram disulfide.
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Triethyl-trimethylenetriamine.
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Phthalic anhydride.
Salicylic acid.

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Calcium hydroxide.
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Diethylamine.
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Magnesium carbonate.
Magnesium oxide, light and heavy.
Malic acid.
Sodium acetate.
Soybean lecithin-*p*-triethanolamine.
Stannous chloride.
Stearic acid.
Tall oil fatty acid.
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Zinc oxide.
Zinc salt of fatty acids.
Zinc stearate.

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1,2-Dihydro-2,2,4-trimethylquinoline, polymerized.
4,4′-Dimethoxy diphenylamine.
Dioctyl phenylenediamine.
Diphenyl ethylenediamine.
*N*,*N*′-Diphenyl-*p*-phenylenediamine.
*N*,*N*′-Disalicylal propylenediamine.
6-Dodecyl-2,2,4-trimethyl-1,2-dihydroquinoline.
6-Ethoxy-1,2-dihydro-2,2,4-trimethylquinoline.
Hydroquinone monobenzyl ether.

Isoproproxy diphenylamine.
*N*-Isopropyl-*N'*-phenyl-*p*-phenylenediamine.
di-*p*-Methoxy diphenylamine.
4-Methyl-6-*tert*-butylphenol.
2,2-Methylene bis(4-methyl-6-nonylphenol).
2,2-Methylene bis(4-methyl-6-*tert*-butylphenol).
di-*β*-Naphthyl-*p*-phenylene-diamine.
tri-(Nonylphenyl) phosphite.
Phenyl-*α*-naphthylamine.
Phenyl-*β*-naphthylamine.
*o*- and *p*-phenylphenol.
Sodium pentachlorophenate.
Styrenated phenol.
4,4'-Thiobis(6-*tert*-butyl-*m*-cresol).
Thiobis(di-*sec*-amylphenol).
2,4-Toluendiamine.
*m*-Toluenediamine.
di-*o*-*Tolyl* ethylenediamine.
*N*-*o*-Tolyl-*N'*-phenyl-*p*-phenylenediamine.
*p*-(*p*-Tolyl-sulfanilamide) diphenylamine.

(4) *Plasticizers.*

Amyl decyl phthalate.
Beeswax.
Butyl acetylricinoleate.
Butyl laurate.
Butyl oleate.
Butyl stearate.
Calcium stearate.
Carnauba wax.
Castor oil.
Coconut fatty acid, distilled.
Corn fatty acid, distilled.
Cottonseed oil.
Coumarone-indene resins.
Dibenzyl adipate.
Dibutoxy-ethoxy-ethyl adipate.
Dibutyl phthalate.
Dibutyl sebacate.
Didecyl adipate.
Didecyl phthalate.
Diisodecyl adipate.
Diisodecyl phthalate.
Diisooctyl adipate.
Diisooctyl sebacate.
Dioctyl adipate.
Dioctyl phthalate.
Dioctyl sebacate.
Ethylene glycol.
Fatty acids, hydrogenated.
Glycerin.
Lanolin.
Lauric acid.
Mineral oil.
Mineral rubber (asphaltite).
Montan wax.
Octyldecyl adipate.
Octyldecyl phthalate.
Oleic acid (red oil).
Paraffin wax.
Petrolatum
Petroleum oil, paraffinic.
Petroleum oil, naphthenic.
Petroleum oil, sulfonated.
Phenol-formaldehyde resins.
Pine tar.
Polybutene.
Propylene glycol.
Rosin oil.
Rosin wood and derivatives
Soyabean fatty acids.
Stearic acid.
Terpene resins.

(5) *Fillers*—(i) *Carbon black.* "Channel" process only.
(ii) *Light-colored fillers*

Aluminum hydrate.
Aluminum silicate.
Antimony oxide.
Antimony trioxide.
Barium sulfate.
Calcium oxide.
Calcium carbonate.
Calcium silicate.
Casein.
Clays.
Cork.
Cotton (floc, fibers, fabric).
Magnesium carbonate.
Mica.
Nylon (floc, fibers, fabric).
Silica.
Talc.
Titanium dioxide.
Wood flour.
Zinc carbonate.
Zinc oxide.
Zinc sulfide.

(6) *Colors.*

Yellow: Cadmium sulfide, zinc chromate.
Blue: Copper phthalocyanine, double silicate of sodium and aluminum with sodium sulfide (ultramarine blue), anthraquinone type.
Red: Cadmium sulfide, pyrazolone (Color Index 21120), red iron oxide.
Green: Phthalocyanine.
White: Calcium sulfate, titanium dioxide.

(7) *Lubricants.*

Monosodium sulfates of higher alcohols.
Polyethylenes of low molecular weights.
Sodium stearate.

(8) *Miscellaneous.*

*tert*-Butyl paracetate.
di-*tert*-Butyl paracresol.
*N*-Dodecyl mercaptan.
mono- and di-Heptyl diphenylamines mixture.
2-Naphthalenthiol.
Polyethylene glycol (molecular weight 6,000).
Styrene monomer.

# Texas-U. S. Chemical Asks Duty Cuts Abroad on Synthetic Rubbers

Texas-U. S. Chemical Co. petitioned the U. S. Tariff Commission and the Committee for Reciprocity Information in July to ask for a reduction of import duties on SBR carbon black masterbatches and oil-extended SBR in Canada and the European Common Market. Clayton F. Ruebensaal, director of commercial planning for Texas-U. S., signed the petition as one of the ten United States producers of oil-extended and carbon black masterbatched SBR in the absence of an SBR producers' association and in accordance with company policy to promote international trade as an essential part of company operations.

It was pointed out that whereas the export of synthetic rubber has been a rapidly growing item, such export is expected to decline during the early 1960's, and the imports into the United States which have been low are expected to increase rapidly as foreign plants come into operation. The accompanying table was furnished to show these relations.

U. S. Exports and Imports of Synthetic Rubber

(In Long Tons)

| Year | Exports | Imports |
|---|---|---|
| 1954 | 30,000 | 16,901 |
| 1955 | 94,000 | 11,309 |
| 1956 | 149,000 | 7,777 |
| 1957 | 203,000 | 6,830 |
| 1958 | 194,000 | 9,305 |
| 1959 | 288,000 | 6,719 |
| 1960 (est.) | 300,000 | 10,461 |

Specifically, for SBR carbon black masterbatches a reclassification from Tariff Item 618 (20% ad valorem duty) to Tariff Item 616 [1] (5% ad valorem duty) was suggested for Canada. Reclassification from Brussels Nomenclature No. 40.06 (14% ad valorem duty) to No. 40.02 (List G—de facto duty free) was suggested for ECM. The present classification by Canada and ECM of SBR black masterbatches as rubber manufactures is incorrect, it was pointed out, while such masterbatches are defined by all authoritative technical literature as base or raw rubbers and thus should enjoy the lower import duty of a raw rubber.

In the case of oil-extended SBR, the implication that such rubber is equivalent to a formed or fabricated rubber article or a formulated rubber compound is in error, it was said, and oil-extended SBR's are to all intents and purposes raw rubbers requiring compounding as does crude natural rubber or other raw synthetic rubbers. It is significant that oil-extended SBR is treated as raw rubber by the ECM and should be treated similarly by Canada, it was added. Reclassification from Tariff Item 618 (20% ad valorem duty) to Tariff Item 616 [1] (5% ad valorem duty) was suggested.

An addition to Tariff Item 616 of Canada permitting importation duty free of certain specialty synthetic rubbers as "of a class or kind not made in Canada" was suggested also. Under present conditions, Canadian manufacturers of products incorporating highly specialized rubbers which are not manufactured in Canada must either do without these rubbers or pay duty on them. In the first case, product quality suffers, and in the second the manufacturer is at a price disadvantage in marketing rubber products competitively with other manufacturing countries who do not have an import duty on such specialty raw synthetic rubbers.

Since a number of chemicals and other synthetic industrial raw materials may be imported into Canada as "of a class or kind not made in Canada" where in end-use the Canadian and imported products are not completely interchangeable, the specialty synthetic rubbers should be treated in a similar manner, it was said.

The United States' principal continuing market for synthetic rubber in export markets will be for specialty types not made by the general-purpose plants being built abroad. It is mandatory, therefore, that these special-purpose types or general-purpose types manufactured by advanced American technology be admitted to foreign countries as raw rubbers and not as compounded rubbers, the petition stated.

The basic contention of the petition is that oil and/or black masterbatch rubber is still base polymer.

# Synthetic Rubber Producers Get Favorable Fifth Annual Report

Surveying the 1959 activities of the youthful synthetic rubber industry, Attorney General William P. Rogers reported in September that major industry developments "all bespeak dynamic growth and competitive energy." The Fifth Annual Report of the Attorney General thus constitutes another clean bill of health, on balance, for competitive growth in the synthetic field.

Rogers' report, one of ten annual surveys the Attorney General is required to make under an injunction in the 1953 Synthetic Rubber Plant Disposal Act, has, however, certain reservations.

"In general-purpose rubber, the field primarily affected by the Disposal Act, Goodrich-Gulf, Firestone and—particularly—Goodyear, continue to command very substantial shares of industry capacity, production and sales," he said in the 62-page report.

## Leadership Challenged

Against this, though, Rogers points out that the leading three companies have energetically vied with one another for industry leadership while newcomers, the noteworthy case this year being General Tire & Rubber Co., have continued to assert themselves as main contestants for key places in the industry.

The Justice Department, Rogers reported, also is gratified with other demonstrations of competitive vigor since private industry took over from the government. Here he cited the breakdown of the former plant specialization pattern and the increasing emphasis by most producers on more complete diversification of production and sales.

Regionally, he saw increasing penetration of the important West Coast market by eastern manufacturers, although he noted that "Shell has regained a portion of its commanding position" which slipped slightly in the "buyers' market" of 1958. Shell's recoupment was made by dint of active expansion and promotion efforts, Rogers pointed out, "not by default" on the part of its competitors west of the Rockies.

Touching on the competitive picture in synthetic rubber's main feedstocks—butadiene and styrene—the Attorney General found a "generally weaker picture," particularly with regard to butadiene. This raw material, he said, in 1959 experienced another disappointing contraction of the open market, as it did the year before. The only ray of hope—reported by some producers—is that butadiene may yet develop a substantial market outside the synthetic rubber industry and thereby "give some substance to the hope that eventually butadiene may achieve some measure of the independence from synthetic rubber displayed by styrene."

In the case of the latter, expansion of general demand is such that synthetic rubber—even with the sharply increased production levels of 1959—absorbed a smaller portion of styrene output than ever before.

## Butyl Progress Seen

Another competitive weak spot is in butyl rubber. Here, the Attorney General stated, market rivalry is "virtually non-existent," with practically all capacity concentrated in the hands of one producer. Even so, he said he is realist enough not to expect material changes in this picture until there is a greatly increased demand, within and outside the industry, for this specialty synthetic.

Even here, though, a ray of hope was found. Firestone, the Attorney General noted, plans to market its own premium all-butyl tire as an outgrowth of its production experience, for the account of Esso, in making the "Bucron" butyl tire. Further, he said, intensive research with butyl is bearing fruit, making it possible to develop new applications that may expand the market. Finally, it was stated, even though still a narrow slice of overall synthetic production, butyl last year managed to increase its total share—from 5% to 6%, or about one-third of the specialties' 18% share of aggregate synthetic output.

Discussing the Justice Department's annual survey of small business firms in the industry to see how they fared with the larger manufacturers, Rogers also expressed satisfaction on this point. There were "no signs of discrimination against small business" in the distribution of S-type synthetics, and "all the small firms sampled reported obtaining all the rubber they needed without difficulty," he declared.

If there was any competitive question mark that really disturbed the Attorney General in his 1959 survey of the industry, it was a June, 1960, ruling by a District Court Judge that General Tire and Rubber Co. was entitled to a patent on oil-extended rubber used in tire treads. He also expressed some concern about the formation of the International Synthetic Rubber Producers Institute, although he conceded that such a trade organization was justified in the young industry.

On the General case,[1] Rogers—who as chief legal officer of the government opposed the General patent application—said that "at best, this litigation will introduce considerable uncertainty in the marketing of oil-extended rubber. At worst, the royalties which General may be able to levy on the rubber industry in the making of tire treads may give it a decided competitive advantage over other synthetic rubber producers."

[1]See RUBBER WORLD, July, 1960, p. 101.

## Will Watch Institute

On the formation of ISRPI, Rogers expressed some worry that "a trade association (often is) a convenient vehicle for inception and furtherance of anti-competitive industry behavior." He added, "Certainly, such a possibility must be considered in an industry like synthetic rubber, concentrated in a limited number of companies, all comparatively large in size in resources."

Accordingly, he promised, "The activities of this new trade association must be given appropriate consideration" in the next five annual reports the Justice Department is required to make on the competitive situation within the synthetic rubber industry.

## Report Highlights

Following is a chapter-by-chapter account of the highlights of the Fifth Annual Report, along with illustrative tables:

**General Developments**—1959 was a banner year by all standards of measurement. Despite the long rubber industry strikes early in the year, output resumed at a fast enough clip later to push production to a new all-time high, 1,380,000 tons. Consumption was 1.6 million tons, 100,000 tons higher than the previous record year of 1957. These two figures helped pull synthetic's ratio of the new rubber market from the 63% level of 1958 to a cool two-thirds of the total natural-synthetic market, 66% even. Exports, which Rogers admitted he guessed wrong on a year ago when he forecast a 1959 decline, jumped almost 100,000 tons to 290,000 tons, another record. Finally, and most important, 1959 saw the introduction of and acceptance of the "new" synthetics, polyisoprene and polybutadiene, the so-called "synthetic-naturals." Ticked off were the mushrooming expansion programs of rubber and chemical industries, here and abroad, which are jumping into this field.

**The Pattern of S-Type Competition**—1959 saw the "reversal of a trend toward increased market concentration

among the three largest producers" of SBR. Their collective share of production and sales dropped slightly for the second straight year to the accompaniment of a trend away from plant specialization and product diversification. On plant capacity, Goodrich-Gulf surpassed the traditional leader, Goodyear; while new entrants in the competitive race, such as Copolymer and General, showed a sharp capacity buildup. Also to be noted is that the comparatively small new addition to capacity, 73,000 tons, was supplemental facilities to add oil or carbon black rather than basic polymerization capacity. (See Table 1.)

TABLE 1. S-TYPE RUBBER CAPACITY,[1] BY COMPANY, 1955, 1958-60

[Thousands of Long Tons]

| Company[2] | May 1, 1955 | Dec. 31, 1958 | Dec. 31, 1959 | Anticipated Capacity Dec. 31, 1960 |
|---|---|---|---|---|
| Goodyear (2) | 146.6 | 255.6 | 270.0 | 270.0 |
| Firestone (3) | 129.6 | 231.5 | 231.5 | 251.5 |
| Goodrich-Gulf (1) | 95.0 | 247.0 | 272.5 | 272.5 |
| Shell (6) | 94.0 | 126.0 | 104.0 | 104.0 |
| Texas-U.S. (4) | 88.0 | 127.0 | 143.0 | 156.0 |
| Phillips (5) | 69.4 | 118.0 | 121.5 | 121.5 |
| United Rubber (9) | [3]62.0 | 69.8 | 69.8 | 69.8 |
| Copolymer (7) | 49.0 | 75.0 | 95.0 | 133.0 |
| ASRC (8) | 44.0 | 68.5 | 75.0 | 75.0 |
| U. S. Rubber (11) | 22.2 | 30.0 | 32.0 | 32.0 |
| General (10) | ... | [5,6]54.0 | [6]54.0 | [6]54.0 |
| All other[4] | ... | 7.7 | 14.8 | 20.3 |
| Total | 799.7 | [5]1,410.1 | 1,483.1 | 1,559.6 |

[1] Productive capacity, including the weight of oil and carbon black, and assuming the "normal pattern of production" experienced by the company.
[2] Companies are listed in order of relative size at the time plants were transferred to private ownership. Figure listed after company name identifies the rank in order of 1959 S-type capacity.
[3] Capacity on July 15, 1955, when Baytown, Tex., plant was transferred to United Rubber & Chemical Co.
[4] Includes Dewey & Almy Chemical Division, W. R. Grace & Co., and International Latex Corp.
[5] Revised.
[6] Estimated.

The "Big Three" producers—Goodrich-Gulf, Goodyear, and Firestone—showed a loss in their collective share of production and sales for the second consecutive year, despite a net gain by Goodrich-Gulf. The biggest relative gains were recorded by Copolymer and General. (See Table 2.)

In production by categories, oil-black masterbatch made rapid strides in increased usage and in 1959 amounted to a full 10% of overall S-type production. Corresponding to this increased interest in oil-black masterbatch was a broadening base of competition, with each of the original producers losing ground while almost all new entrants in the field in 1958 gained substantially. (See Table 3.)

TABLE 2. MARKET POSITION OF S-TYPE RUBBER PRODUCERS, 1955, 1958-59

| Company[1] | Percentage of Capacity | | | Percentage of Production | | | Percentage of Domestic Sales[3] | | |
|---|---|---|---|---|---|---|---|---|---|
| | May 1, 1955 | Dec. 31, 1958[2] | Dec. 31, 1959 | May-Dec., 1955 | 1958 | 1959 | May-Dec., 1955 | 1958 | 1959 |
| Goodyear (2) | 18.3 | 18.2 | 18.2 | 17.7 | 24.1 | 23.9 | 23.0 | 22.2 | 20.0 |
| Firestone (3) | 16.2 | 16.4 | 15.6 | 19.1 | 19.4 | 17.1 | 19.9 | 18.3 | 17.9 |
| Goodrich-Gulf (1) | 11.9 | 17.5 | 18.4 | 12.7 | 12.2 | 12.7 | 10.3 | 11.2 | 11.8 |
| Shell (6) | 11.7 | 8.9 | 7.0 | 10.2 | 6.3 | 7.2 | 10.6 | 6.9 | 7.1 |
| Texas-U.S. (4) | 11.0 | 9.0 | 9.6 | 12.0 | 9.2 | 9.6 | 10.4 | 10.3 | 10.2 |
| Phillips (5) | 8.7 | 8.4 | 8.2 | 7.1 | 8.1 | 7.7 | 8.0 | 7.0 | 7.2 |
| United Rubber (9) | [4]7.8 | 5.0 | 4.7 | 3.7 | 4.2 | 3.5 | 5.0 | 6.7 | 5.5 |
| Copolymer (7) | 6.1 | 5.3 | 6.4 | 6.4 | 6.6 | 7.0 | 5.6 | 7.9 | 9.0 |
| ASRC (8) | 5.5 | 4.9 | 5.1 | 6.6 | 4.4 | 5.2 | 5.3 | 4.6 | 5.0 |
| U. S. Rubber (11) | 2.8 | 2.1 | 2.2 | 2.6 | 2.2 | 1.9 | 1.9 | 2.3 | 1.8 |
| General (10) | ... | 3.8 | 3.6 | ... | 3.1 | 4.0 | ... | 2.4 | 4.2 |
| All others[5] | ... | 0.6 | 1.0 | [6]1.9 | 0.2 | 0.2 | ... | 0.2 | 0.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

[1] Companies are listed in order of relative size at the time plants were transferred to private ownership. Figure listed after company name identifies the rank in order of 1959 S-type capacity.
[2] Revised.
[3] Includes intracompany transfers and sales to affiliates. Excludes domestic resale of purchased rubber.
[4] Capacity on July 15, 1955, when Baytown, Tex., plant was transferred to United Rubber & Chemical Co.
[5] Includes Dewey & Almy Chemical Division, W. R. Grace & Co., and International Latex Corp.
[6] Government production at Baytown, Tex., plant, May 1 to July 15, 1955.

TABLE 3. DISTRIBUTION OF COLD OIL-BLACK MASTERBATCH RUBBER PRODUCTION, BY COMPANY, 1955, 1958-59 (IN %)

| Company[1] | May-Dec., 1955 | 1958 | 1959 |
|---|---|---|---|
| United Rubber (9) | [2]77.3 | 41.1 | 21.5 |
| Phillips (5) | 13.6 | 12.1 | 11.7 |
| Shell (6) | 9.1 | 10.9 | 9.1 |
| Copolymer (7) | ... | 18.7 | 23.6 |
| Texas-U.S. (4) | ... | 8.4 | 17.3 |
| Firestone (3) | ... | 4.4 | 4.1 |
| Goodyear (2) | ... | 2.6 | 0.5 |
| Goodrich-Gulf (1) | ... | 1.6 | 8.9 |
| General (10) | ... | 0.2 | 3.3 |
| Total | 100.0 | 100.0 | 100.0 |

[1] Companies are listed in order of cold oil-black masterbatch rubber production (1955) after transfer of plants to private ownership. Figure listed after company name identifies the rank in order of total 1959 S-type capacity.
[2] Includes government production at Baytown, Tex., plant, May 1 to July 15, 1955, prior to transfer to the United Rubber & Chemical Co.

TABLE 4. DISTRIBUTION OF DOMESTIC S-TYPE RUBBER SALES, BY COMPANY, TO MAJOR CONSUMING GROUPS, 1959

| Company[1] | Percentage of Domestic Sales: Percentage of Total Domestic Sales[2] | Intracompany Transfers | Affiliated or Constituent Companies | Big Five[3] Rubber Companies | All Other Companies |
|---|---|---|---|---|---|
| Goodrich-Gulf | 11.8 | ... | 8.9 | 0.1 | 2.8 |
| Goodyear | 20.0 | 12.2 | ... | 0.8 | 7.0 |
| Firestone | 17.9 | 10.4 | ... | 0.2 | 7.3 |
| Texas-U.S. | 10.2 | ... | 8.0 | 0.4 | 1.8 |
| Phillips | 7.2 | ... | ... | 1.2 | 6.0 |
| Shell | 7.1 | ... | ... | 3.5 | 3.6 |
| Copolymer | 9.0 | ... | 6.0 | 1.4 | 1.6 |
| ASRC | 5.0 | ... | 2.9 | 0.7 | 1.4 |
| United Rubber | 5.5 | ... | ... | 1.4 | 4.1 |
| General | 4.2 | 2.5 | ... | 1.2 | 1.2 |
| U.S. Rubber | 1.8 | 0.5 | ... | 0.1 | 1.2 |
| All other[4] | 0.3 | 0.1 | ... | ... | 0.2 |
| Total domestic sales of all companies | 100.0 | 25.7 | 25.8 | 11.0 | 37.5 |

[1] Companies are listed in order of rank based on total 1959 S-type capacity.
[2] Excludes domestic resale of purchased rubber.
[3] Excludes intracompany transfers and sales to affiliated or constituent companies.
[4] Includes Dewey & Almy Chemical Division, W. R. Grace & Co., International Latex Corp.

TABLE 5. DISTRIBUTION OF WEST COAST SALES OF S-TYPE RUBBER, BY COMPANY, 1958-59

| Company[1] | Percentage of Total Sales on the West Coast | | Percentage West Coast Sales of Company's Total Domestic Sales[2] | |
|---|---|---|---|---|
| | 1958 | 1959 | 1958 | 1959 |
| Shell (6) | 59.5 | 64.4 | 79.7 | 85.9 |
| Firestone (3) | 11.5 | 10.5 | 5.8 | 5.5 |
| Goodrich-Gulf (1) | 9.8 | 10.2 | 8.1 | 8.1 |
| Goodyear (2) | 13.4 | 6.4 | 5.6 | 3.0 |
| General (10) | 1.6 | 3.7 | 6.1 | 8.3 |
| Copolymer (7) | 0.3 | 1.5 | 0.4 | 1.5 |
| Texas-U.S. (4) | 1.8 | 0.9 | 1.6 | 0.8 |
| Phillips (5) | 0.5 | 0.9 | 0.7 | 1.1 |
| ASRC (8) | 0.5 | 0.7 | 1.0 | 1.3 |
| United Rubber (9) | 1.0 | 0.5 | 1.4 | 0.8 |
| U. S. Rubber (11) | 0.1 | 100.0 | 9.3 | 10.1 |
| Total all companies | 100.0 | 100.0 | 9.3 | 10.1 |

[1] Companies are listed in order of West Coast sales volume in 1959. Figure listed after company name identifies the rank in order of total 1959 S-type capacity.
[2] Includes intracompany transfers, where applicable.

In S-type sales, open market transactions—as distinct from "captive" intracompany transfers—"expanded to the greatest extent noted in recent years." In contrast to the decline in captive sales from 58.7% of total output in 1957 to 53.5% in 1959, sales to independent fabricators, jobbers, and processors rose from 34.6 to 37.5% last year. Also notable was the in-

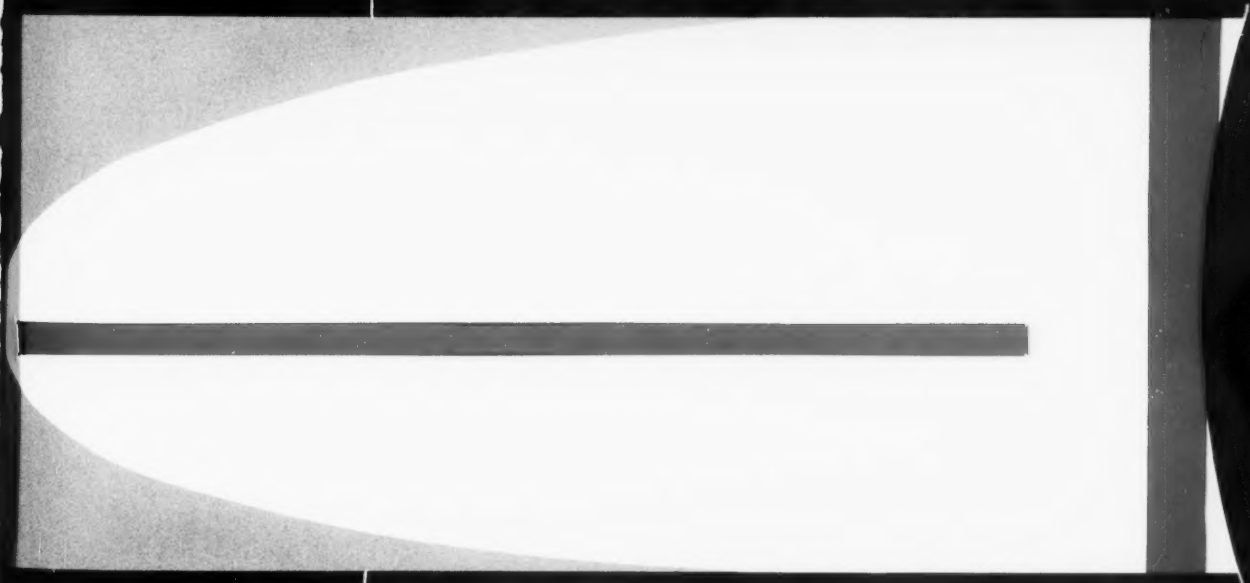
*(Continued on page 127)*

Companies

*Pull the tab*
*and watch*
*the oldest name in*
*carbon black*
*become the newest*
*name in carbon black*

**GODFREY L. CABOT, INC.**

*has changed*
*its name*
*to . . .*



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*Our address, telephone number and*
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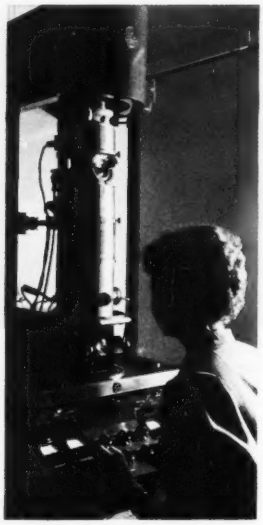
*And all the products and skills*
*which have made Cabot the world's*
*number one producer of Carbon Black*
*(and an increasingly important*
*supplier of other vital raw*
*materials for industry, as well)*
*are at your disposal as always.*

*Our desire and ability to find new*
*and better ways to be of service*
*to you are stronger than ever.*



CABOT

# CABOT CORPORATION

Cabot Offices in: AKRON • CHICAGO • DALLAS • LOS ANGELES • NEW BRUNSWICK • NEW YORK
Sales representatives in all principal cities of the world
Cabot Carbon of Canada, Ltd., 121 Richmond Street West, Toronto 1, Ontario, Canada
Cabot Carbon Limited, 62 Brompton Road, London, S.W. 3, England
Cabot France, S.A., 45, rue de Courcelles, Paris 8, France
Cabot Italiana S.p.A., Piazza Mameli 5, Ravenna, Italy
Cabot Europa, 45, rue de Courcelles, Paris 8, France
Joint ownership of Australian Carbon Black (Pty.) Limited, Millers Road, Altona, Victoria, Australia

# U. S. Rubber Reclaiming Co. Helps To Build Reclaim Industries Abroad

As production of rubber products abroad has grown, particularly in the underdeveloped countries, the need of reclaimed rubber has risen rapidly.

One of the American firms helping to create infant reclaim industries abroad is U. S. Rubber Reclaiming Co., Buffalo, N. Y., which has licensed three foreign firms to use its patented Reclaimator process and is looking forward to considerable expansion of its licensing program in the next few years.

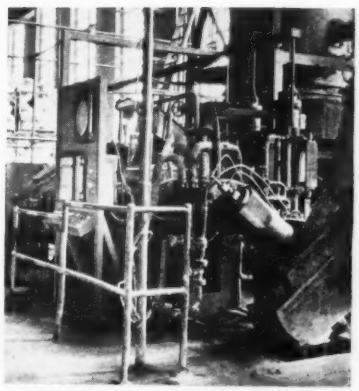
The company does not license its process to American firms. However, looking forward to continued expansion in domestic use of reclaimed rubber, the company is now building a $1,250,000 plant at Vicksburg, Miss., which will have a capacity of 20 million pounds of reclaim a year.

The plant, scheduled to begin production at the end of 1960, uses the Reclaimator process exclusively. The company's Cheektowaga, N. Y., plant produced 73 million pounds of reclaim last year, 40 million of them by the Reclaimator process.

The most recent firm to conclude a licensing agreement for the Reclaimator process is Gamid Rubber Products & Plastics Co., Ltd., Natanya, Israel, which will produce reclaim for new tire, tubes, and mechanical goods production. The plant, which will have a capacity of 7,000 pounds of reclaim a day when finished next year, will supply three major and several smaller manufacturers in Israel's growing rubber industry. This plant will also have enough production left over for exports to East Africa and eastern Europe.

Up to now Israel's reclaim has been supplied by a few small, obsolete shops, and officials of U. S. Rubber Reclaiming Co. consider it highly likely that Gamid Rubber will expand its reclaim facilities in a comparatively short time. The initial installation of a six-inch Reclaimator plus auxiliary machines cost $300,000. Tripling of production would only cost an additional $180,000, the U. S. firm estimates.

In 1958, Pirelli Societa per Azioni installed one six-inch machine in its plant in Milan, Italy, and is now planning the installation of a 12-inch machine, which has a capacity of 35,000 pounds of reclaim a day. The firm eventually intends to install the machines in five countries with output being used in the production of tires and tubes, the company reports.



A Reclaimator is shown in operation at the Milan plant of Pirelli Societa per Azioni, one of three foreign films to conclude a licensing agreement with U. S. Rubber Reclaiming Co.

The first firm to install a Reclaimator was Fabrica Argentina de Alpargatas, S.A.I.C., Argentina's largest manufacturer. The firm, which manufactures a variety of rubber goods, leather and rubber footwear, tire fabrics, and many other products including 90,000 pairs of hemp sandals a day, installed one six-inch machine in 1956 and added a second and a third machine later. Today it produces 25,000 pounds of reclaim daily and is considering further expansion.

In addition, firms in Spain, Brazil, Austria, and the United Kingdom have expressed active interest in the process, U. S. Rubber Reclaiming reveals.

The advantage claimed for the process, one which would be of particular interest to countries just beginning reclaim industries, is a good rate of production at comparatively low cost of installation. Under the licensing agreements made to date, U. S. Rubber Reclaiming designs and engineers a complete plant, furnishes services of qualified technicians to start up and assist in production, and participate in a mutual exchange of information. In return it asks for a 15-year licensing agreement with a five-year minimum royalty payment.

The United States exported only 13,027 tons of reclaim last year and has experienced a moderate increase in exports so far this year due to growing world demands for reclaim. The Buffalo firm foresees that eventually construction of reclaim plants abroad will cut into U. S. export business. As a matter of fact, it is pointing out to potential licensees that setting up plants will cut the need of importing reclaim.

So far reclaim manufactured abroad by the Reclaimator process is only a tiny fraction of the 213,000 long tons' capacity of the eight leading non-Communist producers outside the United States. (The United States has an estimated capacity of 373,000 long tons, according to the International Rubber Study Group.) But U. S. Rubber Reclaiming Co. expects considerable expansion of its licensing program in the future, and meanwhile many countries, such as India, are setting up plants using other reclaim processes.

The answer, officials of the U. S. firm say, is that for a while, at least, expansion of rubber use abroad will keep pace with increase in construction of new facilities. Eventually, they agree, the trend will cut exports.

The Reclaimator process consists of feeding finely ground rubber crumb, together with chemical reclaiming agents, into a cylinder containing a screw for conveying and working the charge against the chamber wall. Transit time is one minute to four minutes. Devulcanized material may be extruded in slab form, refiner sheeted, or powdered for use in bulk handling systems.

The process has the advantage of being continuous and is considerably faster than the five to 24 hours required for the batch digester process most commonly used for reclaim.

# Synthetic Rubber Producers Meet To Form Worldwide Organization

Fourteen synthetic rubber companies in the United States, Canada, England and West Germany have formed the International Institute of Synthetic Rubber Producers, with the likelihood that companies from Italy and Japan will also join. The Italian and Japanese firms participated in establishment of the Institute, but are waiting approval of their directors to become members.

At its first meeting in mid-September, the organization elected Thomas C. Cubbage, Phillips Chemical Co., president; while Bancroft Henderson, former president of American Synthetic Rubber Corp., was made managing director. Other officers are Judson T. Black, Polymer Corp., Ltd., vice president; George Hackim, General Tire & Rubber Co., secretary; and James C. Roberts, Firestone Synthetic Rubber & Latex Co., treasurer.

Membership in the Institute is open to manufacturers. Separate sections are being established for firms interested in general-purpose synthetic rubbers, special-purpose rubbers, and synthetic latices. The Institute has two geographical sections, North American and European. Far Eastern and South American sections are also contemplated.

The organization has the stated purpose of enabling manufacturers to develop and exchange information in order to promote international trade in synthetic rubber and encourage scientific advances within the industry. Activities will be carried on through technical, traffic, packaging, and statistical committees. Headquarters are to be set up in New York, N. Y., and in Europe.

Bancroft Henderson

United States members of the Institute are Firestone, Goodyear Tire & Rubber Co., United States Rubber Co., Goodrich-Gulf Chemicals, Inc., American Synthetic Rubber, Copolymer Rubber & Chemical Corp., General Tire, Phillips Chemical, United Carbon Co., and Shell Chemical Co.

The other members are Polymer Corp., Canada; International Synthetic Rubber Co. and Shell International Chemical Co., Ltd., England; and Chemische Werks Huls A.G., Germany. The two firms which have not yet joined are A.N.I.C, Milan, Italy, and the Japan Synthetic Rubber Co., Tokyo.

## U. S. Rubber To Build Stereo Rubbers Plant

The major part of the emphasis in stereo regular rubbers to date has been on *cis*-polyisoprene and *cis*-polybutadiene, which are looked to as eventual replacements for natural rubber. United States Rubber Co., however, is taking a different approach.

The company's Naugatuck Chemical Division is starting production later this year on a $2-million pilot plant in Baton Rouge, La., to produce the stereo regular synthetic rubbers. Initial production, however, will be on *trans*-polybutadiene, synthetic balata-like material, and ethylene-propylene rubbers, which are seen eventually displacing SBR as general-purpose rubbers.

The plant will have a capacity of about three tons a day, sufficient production to evaluate the new rubbers in end-products.

Ethylene-propylene copolymers can be produced from low-cost materials with high resistance to aging and abrasion, and approximately the same amount of heat buildup as SBR under certain conditions. These copolymers, however, are difficult to cure and are incompatible with present elastomers, and apparently some distance from general-purpose use.

Hercules Powder Co. and Avisun Corp. have built pilot facilities for ethylene-propylene rubbers, and Goodrich-Gulf Chemical Co. is also reported at the production stage, with the other major rubber producers conducting research on the rubber. The Montecatini Group of Milan, Italy, which did the pioneer work on the copolymers, is building a 20,000-ton plant for ethylene-propylene and ethylene-butylene copolymers in Brindisi, and is reported to have made tires of ethylene-propylene rubbers.

Synthetic balata, the other rubber scheduled for initial production, has prospects of a good market, since natural balata, which grows wild in South America, has become increasingly scarce. At the moment its price is close to $5 a pound. The natural product is used principally for golf ball covers, but synthetic balata is expected to find use in shoe products and molded goods.

## Latex Foam Producers Are Promoting Quality

The Latex Foam Division of The Rubber Manufacturers Association, Inc., New York, N. Y., recently issued, for the first time, a range of compression standards for latex foam mattresses, with sharp definitions for "medium," "firm," and "extra firm" cores. The standards, part of the 1960 revision of "Buyers' Specification — Latex Foam," also include a tightened-up standard for upholstered cushions and a new rule on inspection procedure.

The Foam Rubber Council has also cooperated with the National Association of Manufacturers in production of "Living on Air" a 13½-minute film on latex foam rubber made as one of the NAM's "Industry on Parade" series of television newsreels. This film will be shown by 262 TV stations with an audience of 18 million persons which participate in the "Industry on Parade" program. The film will also be shown overseas by the U. S. Information Agency and U. S. Armed Forces Press, Radio & Television Service and will be screened also for women's clubs, schools, service clubs, and similar interested groups.

"Living on Air" shows the manufacture of latex foam from purified rubber latex and air and pictures its use in the furniture and bedding industries, as underlay for carpets, inner soles for shoes, padding for sports uniforms, and various types of medical devices.

The film is part of the Foam Rubber Division's public relations program, described by Edward Welch, chairman of the Latex Foam Division, at the cushioning session of the annual convention of the National Association of Furniture Manufacturers. The three-year plan also includes a tag program to identify furniture with latex foam rubber upholstery, releases for the women's pages of newspapers, addition to the staff of the Council of a woman home economist to develop contacts with women's clubs and home economics classes, and a series of six television shorts for women's daytime TV programs which will educate the prospective customer on the qualities of latex foam.

## Witco, U. S. Rubber Plan English Firm

Witco Chemical Co., Inc., and United States Rubber Co., both of New York, N. Y., have announced plans for a new chemical company, Sto-Chem, Ltd., to manufacture synthetic rubber latex in England. Each corporation will own half of the new company.

The Sto-Chem plant, to be built on a 20-acre site in the Midlands of England, is scheduled to go into operation in the fall of next year, with an initial annual capacity of 8,000,000 pounds of SBR, NBR, high styrene, and acrylic types of synthetic rubber latices. The total investment by the two firms was announced at more than $2,500,000.

The new plant is planned to meet a rapidly rising demand for synthetic latices in the United Kingdom. Distribution of Sto-Chem's output will be handled exclusively by Witco Chemical Co., Ltd., Witco's wholly owned British subsidiary.

George R. Vila, a group vice president of U. S. Rubber, will be chairman of the board of Sto-Chem, and Douglas Roberts, who has been manager of manufacturing for Witco's United Kingdom operations, will become managing director of the new firm.

When the plant goes into production, it will manufacture under a license from Naugatuck Chemical Division of U. S. Rubber and will have that Division's aid in technical service.

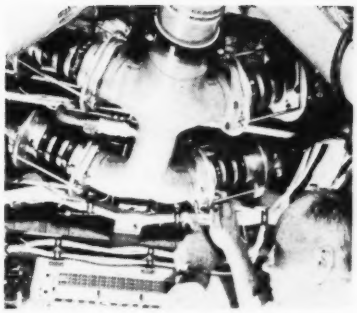
## General Tire Building New Testing Center

The General Tire & Rubber Co. is erecting a new $2½-million tire test center in Mogadore, O., built around a super high-speed aircraft-tire dynamometer now being built by Adamson United Co. The structure, with 33,000 square feet of laboratory space, is expected to be complete by May of next year, but is not expected to be in full operation until the middle of 1962.

The new dynamometer will be capable of speeds up to 350 mph., tire loads to 100,000 pounds, and extremely rapid accelerations and decelerations. The latest electronic programming equipment and instruments will enable operators to control test conditions while viewing the tests through closed-circuit television.

The tire test equipment presently in the Akron plant will also be located in the new center. It includes a 250-mph. aircraft tire dynamometer, pulley wheels for passenger and truck dynamic testing of industrial and passenger tires, a 200,000-pound load machine for tire deflection testing, and a good deal of other equipment.

This new test center will be located on a site adjacent to General Tire's new Research Center building.



**These new lightweight rubber couplings, designed and manufactured by B. F. Goodrich Aviation Products, protect fuel lifelines on the B-52G missile bomber and KC-135 jet tanker produced for the U. S. Air Force. The new coupling withstands torsional loads that cause fatigue failure in metal couplings. The couplings are reinforced internally with multiple fabric plies**

## RW's Editor Looking At European Industry

RUBBER WORLD's editor, R. G. Seaman, is getting a close-up of the European rubber industry during October while attending the meeting of the German Rubber Society in West Berlin and the International Synthetic Rubber Symposium being conducted by *Rubber & Plastics Age* in London.

In addition, he will be visiting the laboratories of the British Rubber Producers Association and those of the British Rubber Manufacturers Association, as well as the French Rubber Institute in Paris, France.

There will be stops made also at the plant of Kleber-Colombes near Paris, the laboratories of Farbenfabriken Bayer in Leverkusen, West Germany, and finally at the Dunlop Research Center in Birmingham, England.

## Flexible Tubing Corp. To Produce Jet Parts

Flexible Tubing Corp., Guilford, Conn., has been awarded a $280,000 Air Force contract for assemblies of a new design of synthetic flexible ducts for use in starting jet aircraft engines. The new jet starter ducts will stand up for between 3,000 and 4,000 starts under all conditions and will cost less than those currently in use, making them of value also for commercial jet airliners, the firm said.

The duct assemblies are 30 feet long and 3½ inches in diameter, made of silicone rubber with an embedded, braided Dacron sleeving and an outer scuff cover of a spirally wound extruded rubber bumper strip bonded to a sleeve of open-weave Dacron. These assemblies are designed for use in conjunction with gas turbine jet starting units under temperatures ranging from minus 65 to plus 140° F., and are designed also to withstand internal temperatures produced by the gas turbines of up to 500° F. at approximately 40 psi.

## Attorney General's Report

*(Continued from page 120)*

creased activity of both jobbers and intermediate processors of synthetic rubber compounds. On the West Coast, where the market continued to expand relative to the total domestic market, Shell increased its sales share from 59.5 to 64.4% in the area; while Goodyear's total declined substantially. (See Tables 4 and 5.)

**Competition in S-Type Raw Materials**—As noted above, there was little improvement in open-market competition for butadiene, and the only noteworthy development in the year was the unconditional sale of the government-owned Louisville, Ky., plant, formerly operated by Publicker Industries, to Rohm & Haas Co. for purposes other than alcohol-butadiene production. Of sidelight interest, however, was the slight, almost tentative rise in exports of butadiene. Total industry capacity, which was over-extended at 1.2 million tons in 1958, rose only 10 million tons, net, last year. Petro-Tex Chemicals, which accounts for about one-fifth of total capacity, remained the industry production and sales leader, although its total in both categories slipped markedly.

Butadiene's raw material twin, styrene, has its production and sales concentrated in companies largely outside the rubber industry and, since its existence antedates the war-born butadiene industry, does not properly fall within the purview of the Justice Department's annual review. Still, the report was pleased to note that the country's top styrene producer, Monsanto, announced it will cut prices in 1961.

**Special-Purpose Synthetics**—In butyl rubber, the start of production in March, 1959, by the French company Socabu brings total world capacity to 153,000 tons. This will increase next year when Humble, dominant butyl rubber producer, brings in another 37,500 tons' capacity. While it is felt butyl has a "promising place" in the premium tire field, the Justice Department will withhold judgment of new competitive forces in butyl production and marketing. Neoprene and nitrile rubber, the other two specialties which with butyl make up 18% of total synthetic output, reflected "no significant changes during 1959 in marketing methods or prices . . ."

# news briefs

**SHELL CHEMICAL CO., synthetic rubber division, has opened two new regional sales offices,** at Lakewood, Calif., serving the western district, and Cleveland, O., serving the central district. H. R. Nebeker, Jr., has been named district manager at Lakewood, and D. P. O'Connell district manager at Cleveland.

**H. MUEHLSTEIN & CO., INC., has moved** its offices to 2411 W. Eighth St., Los Angeles, Calif.

**NATIONAL-STANDARD CO. has become sole owner of National Standard Co., Ltd.** Previously the American firm had owned 78.5% of its English subsidiary. The accounts of the English company will be consolidated into the parent company's account for the first time this year, it was reported.

**THE MANSFIELD RUBBER CANADA, LTD., is expanding its facilities at Barrie,** Ont., for the second time in its five-year existence. Current expansion will consist of 30,000 square feet of warehouse space.

**THE WILSON RUBBER CO., Canton, O., has added a corrugated grip** to its neoprene gloves to increase industrial applications. The gloves, available in both black and white, have minute cross-hatches molded into the fingers and palms, giving added friction on wet or slippery surfaces.

**THOMPSON - RAMO - WOOLDRIDGE PRODUCTS CO. has changed its name to TRW Computers Co.** The firm will continue to function as a computer division of Thompson-Ramo-Wooldridge Inc., with headquarters in Beverly Hills, Calif.

**SHELL CHEMICAL CO. is acquiring a site for its multimillion-dollar polyisoprene plant** on the north bank of the Ohio River, 15 miles west of Marietta, O. Plans call for the plant, with a capacity of 80 million pounds of polyisoprene a year, to be on stream late in 1961. Howard E. Hughes, with the Shell organization since 1934 and for the past year on special assignment working on plans for the new plant, recently was named its manager.

**PENNSALT CHEMICALS CORP., Philadelphia, Pa., has been granted an extension** by the Office of Naval Research of a research contract on inorganic polymers. The extension runs through September, 1961. The contract was originally awarded in 1958.

**COMMERCIAL SOLVENTS CORP., New York, N. Y., has created a separate marketing department** to handle nitroparaffins, developed by the company. Nitroparaffins are presently used as additives for polymerization, in production of grafted polymers for automotive emulsion undercoatings, as coatings solvents, as raw materials for plastics and polyurethane foam, and in the metals, photographic, and drug industries.

**FIBRE LEATHER MFG. CORP., New Bedford, Mass., recently completed installation of ten 10,400-gallon latex storage tanks,** doubling the plant's latex storage capacity. The tank installation is part of a $250,000 expansion and modernization program. The tanks will provide storage capacity to handle an increased volume of business and will also handle new types of synthetic latices being produced to impart desired properties to latex-impregnated papers.

**PLASTICS & RUBBER PRODUCTS CO. has expanded into a new building** adjacent to its existing facilities at 2100 Hyde Park Blvd., Los Angeles, Calif. The new building contains space for new production equipment, expansion of inspection and mold cleaning departments, and office space.

**SIMPLEX WIRE & CABLE CO. stockholders and those of Hitemp Wires, Inc., meeting September 22, approved merger** of the two firms, with exchange of one share of Simplex stock for two shares of Hitemp. Hitemp will operate as Hitemp Wires Co., a division of Simplex.

**BOSTON WOVEN HOSE & RUBBER DIVISION,** American Biltrite Rubber Co., Cambridge, Mass., has appointed Clowe & Cowan, Inc., Amarillo, Tex., a distributor for customers in Texas, New Mexico, and Oklahoma.

**ENJAY CHEMICAL CO., a division of Humble Oil & Refining Co., New York, N. Y., has announced a 60% expansion** of its Baton Rouge, La., plant, increasing benzene capacity from 15 to 24 million gallons a year by the end of this year. Styrene and synthetic phenol, raw materials for rubbers and resins, use well over half the current benzene capacity.

**WOODBRIDGE PLASTICS, INC., Woodbridge, N. J., has been formed** as a corporation to provide custom compounding of vinyl and polyethylene resins for the wire and cable, vinyl shoe, profile extrusion, and injection molding industries. Production was scheduled to begin early in October. Kenneth B. Cary is president, and Richard A. Murphy vice president, sales, of the new firm.

**STANDARD OIL CO. (Sohio) has developed a new single-step process** for direct conversion of propylene, ammonia, and air to acrylonitrile for synthetic rubber and plastics and put on stream this year the first commercial plant to use the process.

**NATIONAL-STANDARD CO. OF CANADA, LTD., manufacturer of bead and reinforcing wire for tires, rubber hose, and similar rubber goods, is completing a new 40,000-square-foot plant** at Guelph, Ont. The $800,000 plant will have 35% more manufacturing space than the 50-year-old plant it replaces.

**MONTROSE CHEMICAL CO., manufacturer of rubber chemicals, and BALDWIN RUBBER CO., maker of molded rubber goods and vinyl goods, are negotiating for a merger** with Centlivre Brewing Corp., the three companies announced. Under the plan, a new corporation, Baldwin-Montrose Chemical Co., would be formed.

**ST. LAWRENCE RUBBER CO.** and **AMERICAN WRINGER CO., Farnham, P.Q., Canada, became operation divisions of Hamstell Corp., Ltd.,** on July 1. Hamstell is a wholly owned subsidiary of Combined Enterprises, Ltd. These two now join Hamilton Gear & Machine Co. and Eastern Steel Products Co. as divisions of Hamstell.

# news about people

R. W. Rice

W. H. Cain

**W. H. Cain** will fill the newly created position of manager, process development, for all manufacturing operations of Firestone Synthetic Rubber & Latex Co., Akron, O. **R. W. Rice** succeeds him as plant manager at the Lake Charles, La., synthetic rubber plant. In addition, **P. A. Boley** takes over Rice's job as production manager at Lake Charles; while **M. W. Littlewood** replaces Boley as industrial relations manager. **J. C. Utley,** former safety engineer at the Orange, Tex., petrochemical center, now has Littlewood's former job of industrial relation manager at Orange.

**Maurice Morton,** professor of polymer chemistry and director of the Institute of Rubber Research at The University of Akron, Akron, O., recently received the Akron Bar Association's Naturalized American Award for 1960. Dr. Morton is also the editor of "Introduction to Rubber Technology" and a member of the editorial board of *Journal of Applied Polymer Science.*

**Howard E. Padgett** has joined Crawford & Russell, Inc., Stamford, Conn., as construction manager, southern division. Padgett has more than 20 years' experience in chemical plant and petroleum refinery construction.

**Philip J. Weaver** has been assigned managership of administrative services, development center, B. F. Goodrich Chemical Co., Avon Lake, O.; while **Norman G. Duke** succeeds him as manager of the product application laboratory. Weaver is now responsible for all staff services, including the supervision of engineering, production, industrial relations, and accounting.

**Ross A. Corio,** in the new capacity of vice president in charge of marketing and sales, Hatco Chemical Division, W. R. Grace & Co., New York, N. Y., will be in charge of the development of new product lines and will be responsible for all division sales operations.

**Richard D. Albee** has joined Hochschwender & Associates Management Consultants, Akron, O., and will be in charge of the installation of methods and standards systems, wage incentives, and the application of engineering and maintenance information to data processing equipment.

**Elmer R. Gibson** and **Charles H. Lessiter** have retired from Seiberling Rubber Co., Akron, O. Gibson, who spent 39 years with the company, was one of the original 29 employes who helped F. A. Seiberling found it. **Donald I. Kyle** succeeds him as purchasing manager. Lessiter spent 26 years with the company doing time studies.

**John R. (Jack) Britt** becomes eastern manager, rocket motors, for B. F. Goodrich Aviation Products Division at Washington, D. C. Prior to this change, he was manager of government sales, sponge products division, for The B. F. Goodrich Co.

**Irving Bederson** has been named sales manager, Anchor Adhesives Corp., Flushing, N. Y.

**R. W. Quarles,** recently named manager of patents and licenses, Union Carbide Plastics Co., division of Union Carbide Corp., New York, N. Y., is responsible for the administration of the patent program, including the licensing and use of patents.

**G. W. Hill** has been named manager of New York operations for International B. F. Goodrich Co. He previously held the position of sales manager of industrial products.

**William M. Hewat,** formerly a technical sales representative, has advanced to western district manager, Naugatuck Chemicals, division of Dominion Rubber Co., Ltd., and will make his headquarters in Edmonton, Alta., Canada.

R. A. Corio

W. J. Hegedus

**Walter J. Hegedus,** field sales engineer, Farrel-Birmingham Co., Inc., Ansonia, Conn., will handle sales of the company's general products and rubber and plastics machinery lines in the Pittsburgh, Pa., area. He replaces **David Neill** now manager of roll grinding sales at the home office.

**J. C. Malone** has been named assistant to the general manager, silicones division, Union Carbide Corp., New York, N. Y., and will work on special assignments for the general manager. **C. T. Schieman, Jr.,** has been appointed general sales manager, and **P. S. Manchester** assistant general sales manager, for the division. In addition, **R. S. Wishart** is now manager, product marketing; **T. F. Hart,** product manager of fluids; and **J. H. Lorenz,** product manager of resins and water repellents. In the field sales group, **J. T. Fontelieu, Jr.,** is the new eastern region manager; **F. S. Phinney,** southern region manager; and **C. F. Tripp,** region product manager, eastern region.

**Richard A. Riley** has been named president of Firestone Rubber & Latex Products Co., Fall River, Mass., a division of The Firestone Tire & Rubber Co., Akron, O. Riley formerly was president of World Bestos Corp., another division of Firestone.

**Austin McLean** is the new sales promotion manager, Beebe Rubber Co., Nashua, N. H., and also continues to direct the sales of its athletic shoe sole division.

**Douglas Talbot** becomes manager of Akron public relations for The Firestone Tire & Rubber Co., Akron, O.

Geddes, Cleveland

J. F. Whiting

R. Bult, Sr.

Fabian Bachrach

P. G. Bratenas

L. R. Tate

Witzel Studio

R. L. Wells

**James F. Whiting,** new sales representative for Hycar special-purpose rubber, B. F. Goodrich Chemical Co., Cleveland, O., makes his headquarters in New York, N. Y., to serve the New York City area, part of Connecticut, and western Massachusetts.

**Donald D. Paulsen** has moved from South Bend, Ind., to Glen Ellyn, Ill., to cover the Chicago and western midwest territory for Fife Mfg. Co., Inc. **Robert L. Fife** has transferred from Oklahoma City, Okla., to Dayton, O., to cover western Ohio, Indiana, Michigan, and parts of the bordering states. **Norman Lippucci** will open the company's new Cleveland, O., office from which he will handle central and western Ohio, upper New York, and parts of Pennsylvania and Virginia.

**Neil C. Foy** has been appointed branch manager, The General Tire & Rubber Co., in Maracaibo, Venezuela. The Venezuelan corporation, Cia. Anon. Nacional Manufacturera de Caucho y Neumaticos General, produces tires, tubes, and miscellaneous rubber products.

**Bernard S. Appleton** has been named president and general manager of Disogrin Industries, Inc., Mount Vernon, N. Y., a manufacturer of polyurethane products.

**P. W. Perdriau** is now president of B. F. Goodrich Industrial Products Co., Akron, O. He was general manager of B. F. Goodrich Aviation Products.

**Robert Bult, Sr.,** has been appointed president-managing director of Firestone France, Paris, and will be in charge of all Firestone operations in France, including the company's new tire plant in Bethune and the synthetic rubber plant in Port Jerome. Both plants are now under construction. For the past 25 years, Bult was managing director of Firestone's affiliate company in Pratteln, Switzerland.

**Paul G. Bratenas** has been appointed general manager, manufacturing, of B. F. Goodrich Footwear & Flooring Co., Watertown, Mass.

**H. R. Sontag** will be the plant manager for the new Beaumont, Tex., synthetic rubber plant which Goodyear Tire & Rubber Co. expects to be completed late next year. It will produce polybutadiene and polyisoprene synthetic rubbers.

**Ira G. Needles** resigned as chairman of the board of B. F. Goodrich Canada, Ltd., on September 30. Mr. Needles was chairman since 1958 and had served as president from 1951 to 1958. He first went to Canada in 1925 as general tire sales manager. He and his wife, now Canadian citizens, will continue to live in Kitchener.

**F. Leonard Bryant** has been elected executive vice president and a director of Hooker Chemical Corp., Niagara Falls, N. Y. He was a vice president since 1957. **Thomas F. Willers,** another vice president, and **Werner P. Gullander** have also been elected directors and members of the executive committee of the board.

**Anselm Talalay** becomes general manager of B. F. Goodrich Sponge Products, Shelton, Conn., on November 1. He is known for development of the Talalay process for making foam rubber.

**Edward W. McCarthy** has been appointed a vice president of Chemical Rubber Products, Inc., Beacon, N. Y., and will continue his activities as director of research and development of coated fabrics.

**Richard L. Wells** and **L. R. Tate** have been assigned to the sales staff of H. M. Royal, Inc., Downey, Calif., and will call on accounts in Los Angeles and vicinity.

**Dagobert F. Pfeiffer** will serve Gates Rubber Co., Denver, Colo., as sales manager for Austria, Switzerland, and the European Common Market countries, from his headquarters in Zug, Switzerland. For the past four years he was manager of Gates Overseas.

**D. W. Tighe** has been named office manager, Boston district sales office, Union Carbide Plastics Co., and will direct all office functions in the area. He formerly was a sales representative in New York.

**Arthur W. Luedeke,** new sales manager of the industrial chemicals sales department, Commercial Solvents Corp., New York, N. Y., will supervise a nation-wide marketing group handling the company's industrial chemicals.

**Ralph M. Levine** has joined Marbon Chemical Division, Borg-Warner Corp., Washington, W. Va., as group leader in charge of coatings and latices, and **Jay Martin** becomes group leader for rubber applications and evaluation.

**Clinton B. McKeown** has advanced from general manager of manufacturing, B. F. Goodrich Aviation Products division, Akron, O., to division general manager.

Fabian Bachrach

P. W. Perdriau

A. Talalay

Arax Photographic Co.

C. B. McKeown E. W. McCarthy

**William F. McNurney** has been appointed vice president and general manager of General Tire & Rubber Co. of Canada, Ltd., He was eastern regional manager—retail stores in the United States and replaces **R. H. Mallory,** who is being given another assignment.

**Joseph W. Greenan,** new general manager of World Bestos Corp., New Castle, Ind., a division of Firestone, was formerly sales manager.

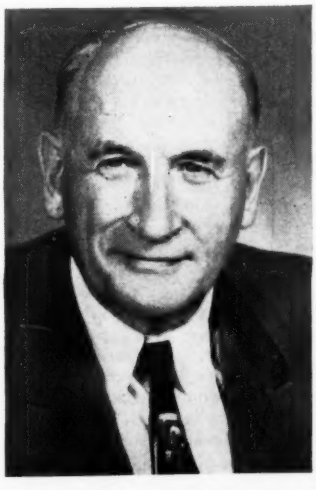
**Wendell Minor,** sales representative at Detroit, Mich., for Goodyear Tire & Rubber Co., has received the company's P. W. and Florence B. Litchfield award for his achievements during 1959.

**A. S. Ballingall** has become president of A. G. Spalding & Bros. of Canada, Ltd., and its wholly owned subsidiary, A. J. Reach, Wright & Ditson, replacing the retiring **S. L. White. John J. Cloghesy** is now general sales manager of the company.

**Byron H. Darst** has been named manager of industrial products sales for International B. F. Goodrich, Akron, O. He has been with the international division since 1945.

**John W. Brownley** has been elected vice president, manufacturing, of Industrial Rayon Corp., Cleveland O. He joined the company as production manager last year.

**Virgil Steinmeyer** has been appointed product manager of the wire and cable division, The Electric Autolite Co., and will make his headquarters at Port Huron, Mich. He was formerly eastern regional sales manager.



William F. O'Neil

# obituaries

## William F. O'Neil

William F. O'Neil, founder and chairman of the board, The General Tire & Rubber Co., Akron, O., died in Akron at the age of 76.

Mr. O'Neil began working at his father's textile mill in Worcester, Mass., while he was still a student at Holy Cross College. After his graduation in 1907 he spent another year working in his father's drygoods store in Akron until he had to go west for his health. On his way there, he met W. E. Fouse, and the two began the Western Tire & Rubber Co., in Kansas City, Mo. They began as tire dealers and later added a line of tire accessories. This developed to nation-wide scope.

In 1915, Mr. O'Neil decided to make his own tires and founded The General Tire & Rubber Co. in Akron. He started in the replacement field and initiated the custom of selling to a single dealer in a city instead of to auto manufacturers.

In 1942 the company began to branch out on a large scale. Two of the largest subsidiaries are RKO-General, Inc., which owns and operates five television stations and seven radio stations, and Aerojet-General which produces rocket-propulsion systems for many of this country's missile programs.

Mr. O'Neil was a trustee of the United States Council of Commerce and an active participant in community and philanthropic work.

He leaves a wife, four sons, one daughter, and 26 grandchildren.

A Solemn High Requiem Mass was sung September 7 at St. Sebastian Church. Burial was at Holy Cross Cemetery.

## Donald F. Fraser

Donald F. Fraser, vice president, manufacturing, Garlock, Inc., Palmyra, N. Y., died September 12 of a heart attack while he was in Virginia.

Mr. Fraser joined Garlock on February 1, 1954, and successively served as acting chief engineer, works manager, and production manager until he was elected vice president, manufacturing, on April 3, 1957.

Prior to his association with Garlock he was vice president and general manager of Rodic Chemical & Rubber Corp., New Brunswick, N. J. (1949-54). Previously he served as general manager of Queen City Tulatex Corp. (1948-49) and development engineer of Monroe Auto Equipment (1944-48).

The deceased was born in Toronto, Ont., Canada, on March 28, 1913. He attended schools in Brampton and then the University of Toronto, from which he was graduated in 1934.

Mr. Fraser was a former director of the New York Rubber Group, a member of the American Chemical Society, and of the American Society of Mechanical Engineers.

Memorial services were conducted at Zion Episcopal Church in Palmyra on September 15, followed by cremation.

Survivors include the widow, two sons, a daughter, his mother, and a sister.

## A. G. Cameron

A. G. Cameron, retired head of Goodyear International Corp., Akron, O., died September 7, at the age of 80.

He originally joined Goodyear as a truck tire salesman in 1913. In 1957 he retired from active service, after having guided the firm's overseas operations from a comparatively small export department into a worldwide sales and manufacturing organization.

Mr. Cameron was born in Knightstown, Ind., and was graduated from Knightstown Academy. He began his business career with a wholesale grocery firm, of which he eventually became vice president.

Funeral services were held September 10 in Cuyahoga Falls, O.

Donald F. Fraser

# news from abroad

## H. C. Bugbee Praises Malayan Replanting

"I know of no other single agricultural project in the world which has been so successful and gives so much assurance for prosperity in the next decade," H. C. Bugbee, president of the Natural Rubber Bureau in Washington, said with reference to the Malayan Government's replanting program, during a press conference.

Mr. Bugbee recently completed a three-week stay in Malaya to study various aspects of the rubber industry and was particularly enthusiastic over what he had seen of the progress made in replanting and new planting in the Federation; he was much impressed by the government's success in overcoming the reluctance of smallholders, in the face of prevailing high rubber prices, to cut down trees in order to replant.

Turning to synthetic rubber competition, he said that this was here to stay, but in view of the efforts by research institutes in Malaya and England to improve rubber, as well as the possibility that production capacity might be increased threefold in the next 10-15 years, he had no fears as to the ability of natural rubber to compete either in price or quality.

Questioned on price control or long-term agreement between Malayan producers and American consumers based on a definite price, he replied that he felt consumers would prefer a free, uncontrolled market. He then went on to say that he was certain that the American Government had no intention of establishing self-sufficiency in rubber and that its principal aim was to keep a healthy and free Malaya.

Approval of the government's replanting scheme and optimism on the future of the Malayan rubber industry were also expressed by the president of the Malayan Estate Owners' Association, Dato Sir Clough Thuraisingham, at the Association's annual meeting. He is sure that before long Malaya will produce enough and better rubber to meet growing world requirements. But with keener competition with synthetic rubber as well as greater demand for natural rubber, the need of a worldwide survey of natural rubber requirements becomes imperative.

Referring to the warnings on the possible harmful effects of high natural rubber prices, he pointed to the general experience of boom-and-slump cycles and called it foolish to say, on a wave of prosperity, that prices were excessive and harmful because a slump was bound to follow. When prices went up, he added, it was said that manufacturers would buy synthetic instead; but when prices fell, over-production of natural was the only explanation offered.

"So," he said, "I prefer a higher price for my rubber than a low price, and to fight the competition of synthetic with every means I have."

## Vietnam and Cambodia Planting Industry

An important difference in the structure of the rubber planting industry in Vietnam and Cambodia, as compared with Malaya and especially Indonesia, is that in those two chief Far Eastern rubber centers, small holdings and small estates under 500 acres together account for more than half the total rubber acreage and output; whereas in Vietnam the large estates, more than 500 acres, cover 75% of the total rubber acreage and provide more than 90% of the output, and in Cambodia they occupy practically the whole of the area planted to rubber and produce almost all the rubber.[1]

Vietnam's total rubber area in 1959 is given as 209,950 acres, including 35 estates of more than 500 acres which have a combined area of 158,600 acres. The three largest of these together have an area of 46,562 acres, and the five smallest, 3,480 acres.

No exact data are available on the small plantations under 250 acres. They, too, suffered seriously under the disturbances, starting in 1945, which cost the Vietnam rubber industry one-third of its acreage. For the total, which at January 1, 1945, was put at 267,800 acres, was only about 209,950 acres in 1959, and this amount even included about 30,000 acres newly-planted since 1946. The area of small plantations that have been rehabilitated is estimated at 50,000 acres.

The fact that the larger estates predominate in Vietnam and Cambodia may at least in part account for the high yields per acre obtained there. In 1959, the averages were 920 pounds per acre, and slightly more than 1,000 per acre, respectively, in Vietnam and Cambodia, against an average of about 560 pounds per acre in 1958, given for both Malayan and Indonesian estates.

The Government of Vietnam has been encouraging new planting and replanting by granting loans at very low rates of interest to owners of more than 25 acres of *Hevea* who agree to extend or replant 5% of their areas each year.

Latest figures for estate production in Vietnam during 1959 come to 65,610 tons, against 62,657 tons the year before. If smallholder rubber is included in the 1959 total, the amount for that year is about 75,000 tons.

[1] *Rev. gén. caoutchouc*, Apr., 1960, p. 449.

## Russians Study High-Pressure Mixing

The principles for determining mixing conditions and methods for raising output of ordinary RS-2 internal mixers, based on high horsepower mixing, are discussed by K. D. Bebris and others in *Soviet Rubber Technology*.[1]

When all ingredients are loaded into the mixer at the same time and upper ram pressure is increased, mixing begins while the rubber is stiff, which condition to some extent promotes better dispersion of the ingredients in the stocks. In several tire factories the procedure for stocks containing channel and anthracene black is to load all materials except the carbon blacks at the beginning of the cycle; the carbon blacks are introduced after 2-3 minutes of operation. In some experiments on channel black stocks conducted at the Scientific Research Institute of the Tire Industry, the order of loading materials was reversed—non-caking furnace black and liquid softeners went in first, then minor ingredients, next rubber, and finally the channel black—directly on to the rubber. With this sequence the liquid softeners are mixed with the other ingredients 0.6-1 minute before the channel black is introduced. The advantage here is that the upper ram is opened only once during the mixing cycle.

When all materials are loaded at the beginning of a cycle, and the batch volume and upper ram pressure are increased, the carbon black cakes less than under normal production conditions; it is assumed that such caking will be completely eliminated when stiffer rubbers and stocks are used.

*(Continued on page 139)*

[1] Apr., 1960, p. 25.

# NOW—in the United States

***THE FAMOUS SHAW INTERMIX***
***internal mixer becomes the . . .***

# ADAMSON-SHAW
## Intermix

**MANUFACTURED, SOLD**
**AND SERVICED IN THE UNITED STATES FOR**
**THE RUBBER AND PLASTICS INDUSTRIES**

*by* **ADAMSON UNITED**
AKRON, OHIO

**THE INTERMIX** was first introduced in 1932 by Francis Shaw & Co. Ltd., Manchester, England. It soon established its now famous reputation for rapid mixing and compounding of a wide range of materials, at low operating expense and *very little maintenance cost.* Today the Intermix is operating in many of the industrial centers of the world, dependably and economically mixing not only all normal rubber and plastic compounds, but many other materials, of which paint, cotton, fibre, ebonite, asphalt-asbestos and aqueous dispersions are examples.

A production size Intermix has been in operation in a U.S. plant of a major rubber manufacturer for approximately two years. Its high performance under American plant conditions, and in direct comparison with internal mixers of other makes, has led to increasing demands by the rubber industry for Intermix installations, field engineering and development services in this country. In response to the industry's interest, Adamson United Company is now manufacturing the Intermix on license from Francis Shaw & Co. Ltd. at its Akron, Ohio, plant where complete machine service, process laboratory facilities and engineering services are also maintained.

Manufactured in seven different sizes ranging from laboratory type units to large production machines, the various Intermix sizes are designated as K-0, K-1, K-2A, K-4, K-5, K-6, and K-7. (See table of specifications on page 6.) Some of the advantages of the Intermix which are important to rubber manufacturers are:

**BETTER DISPERSION**—Unique, patented design of interlocking rotors provides for *kneading* the material, rather than smearing it, as in other types of mixers. Results are fully masticated batches, with all ingredients completely dispersed.

**SHORTER MIXING CYCLES**—This kneading action of the rotors provides for *faster* blending of many compounds, than is obtained from mixers employing conventional smearing action. Greater production per shift is thus obtained.

**COOLER MIXES**—Because of a greater cooling area in contact with the mix, stocks can be dumped at much lower temperatures. The Intermix permits mixing of many low temperature stocks that can otherwise be done only on mills at much slower rates.

**UNIFORM, HIGH QUALITY COMPOUNDS** — Effective temperature control over all contact areas maintains proper plasticity of batch material during the mixing cycle, with resulting *uniform* high material quality.

**LESS MATERIAL WASTE**—Use of new split-ring type dust seals, and self-aligning spherical roller bearings to prevent axial shuttle of the rotors, virtually eliminates material waste due to leakage along rotor shafts.

**MINIMUM MAINTENANCE REQUIREMENT**—The ability of the Intermix to produce dependably through the years with no breakdowns or major repairs is known and appreciated among its many users. Basic design and quality-controlled construction from materials best suited to the purpose, are primary reasons. Just a few of the many design and operating features that contribute to the higher production and lower operating cost of the Intermix are described in more detail on following pages.

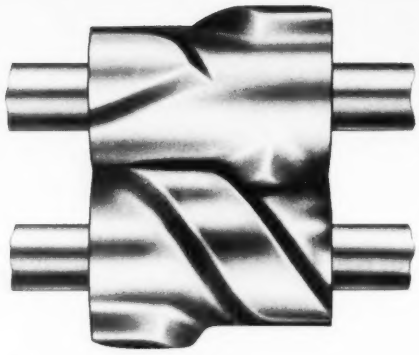


**Fig. 1**

**INTERLOCKING ROTORS** — Mixing and blending of compounds is done by **kneading** the batch between the rotors — not by "smearing" the batch between the rotors and the chamber walls. The result is faster, more thorough mixing, with practically no abrasive wear on the chamber walls.

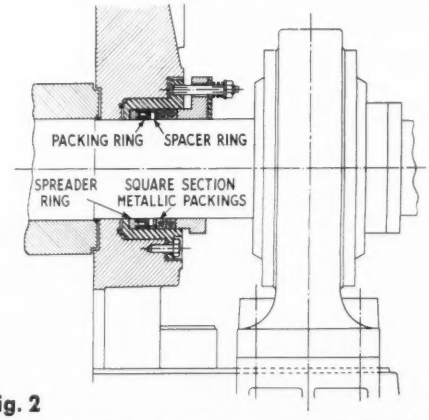



**Fig. 2**

Because Intermix rotor positions are positively fixed both radially and axially by anti-friction roller bearings, the readily accessible dust stop assemblies are not subjected to shaft "float" or "shuttle." Thus, only routine cleaning is required to hold maintenance to a minimum.

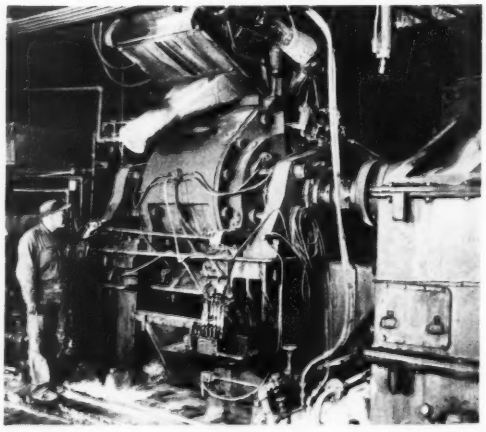


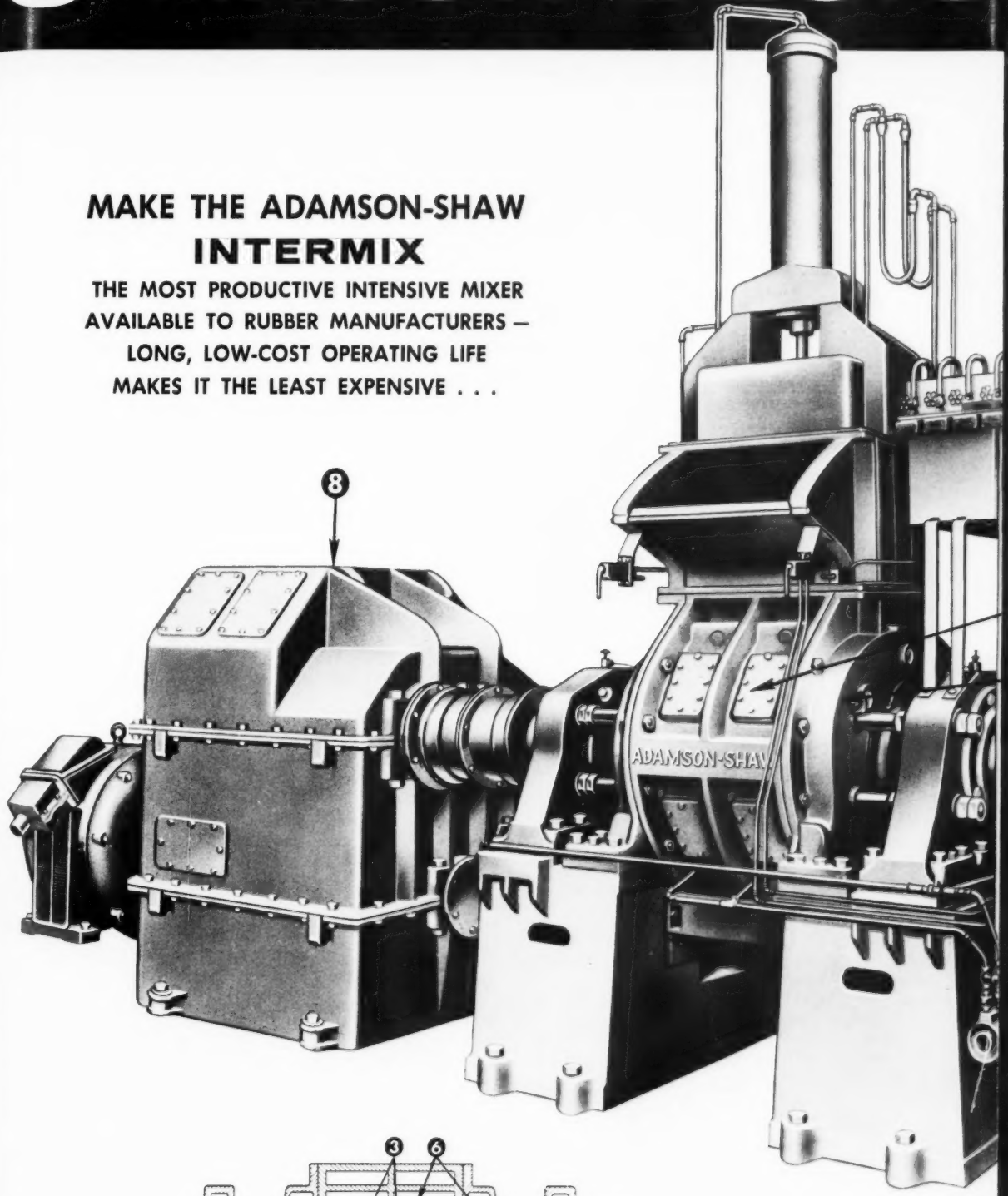
**Fig. 3**

This Size K-7 Intermix has been in use at B. F. Goodrich Co., Akron, Ohio, for approximately two years.

# 8 MAJOR DESIG

## MAKE THE ADAMSON-SHAW INTERMIX

**THE MOST PRODUCTIVE INTENSIVE MIXER AVAILABLE TO RUBBER MANUFACTURERS — LONG, LOW-COST OPERATING LIFE MAKES IT THE LEAST EXPENSIVE . . .**



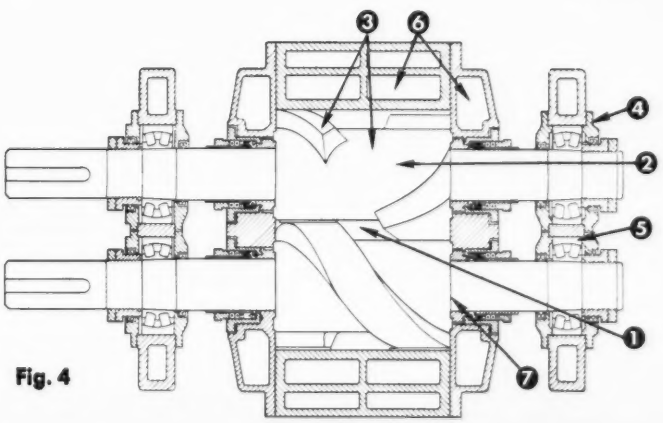
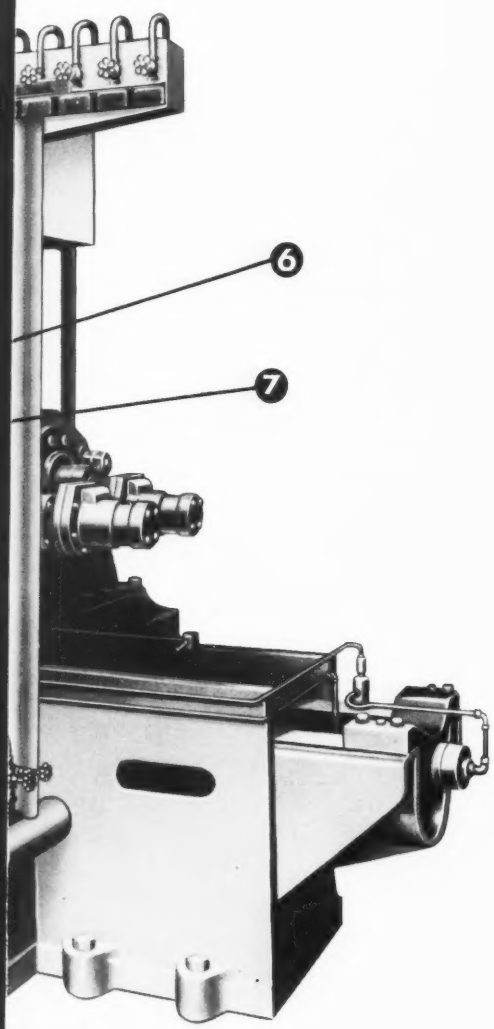




Fig. 4

# N FEATURES




**1. INTERLOCKING ROTORS** provide fast, thorough mastication of the batch. Mixing is accomplished *between the rotors*, instead of between chamber walls and rotors.

**2. BI-METAL ROTOR CONSTRUCTION** makes Intermix rotors stronger, longer wearing, and provides for more efficient cooling.

**3. CORED ROTORS AND NOGS** provide chambers for steam heating or water cooling, making possible more precise control of mixing temperatures.

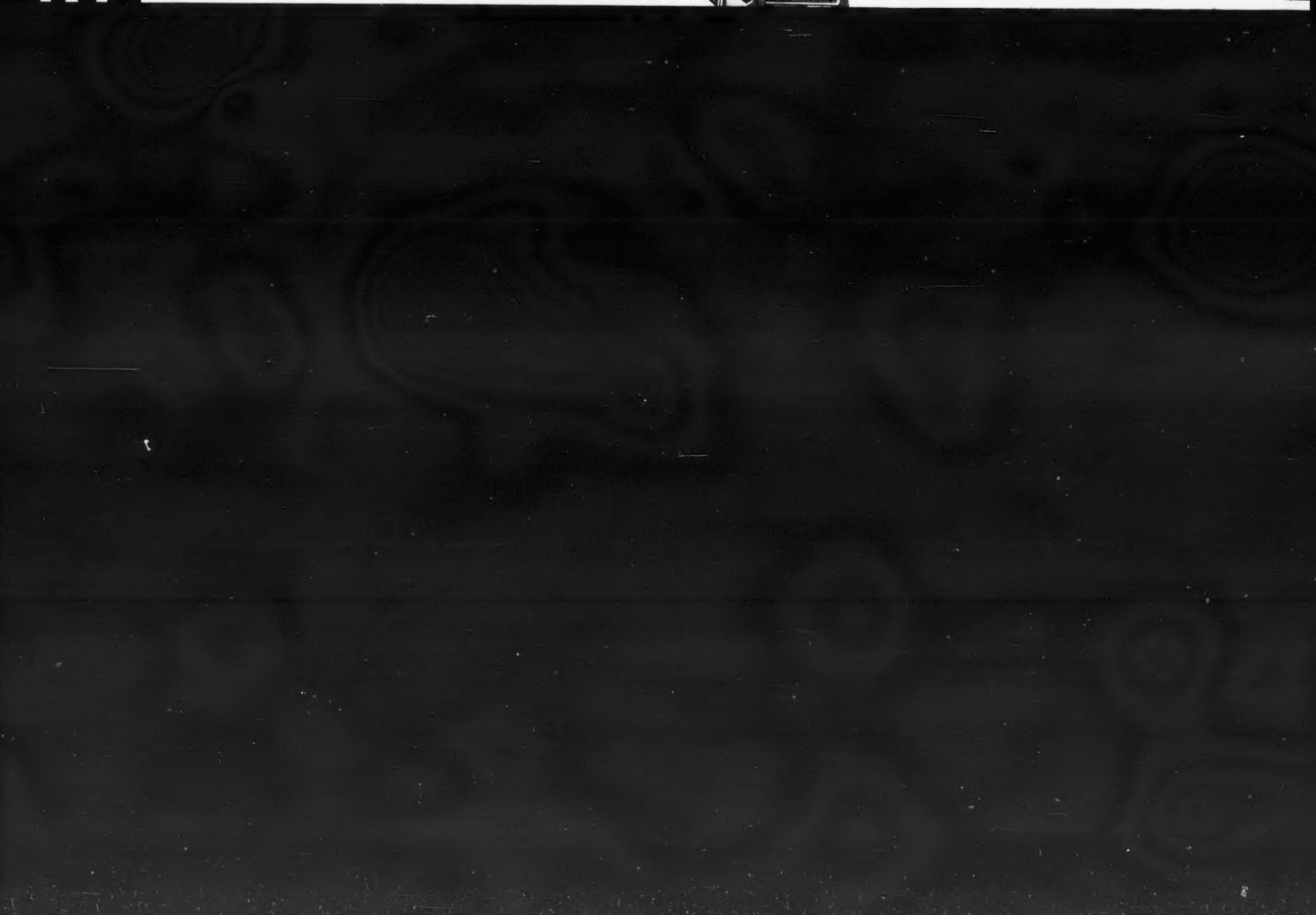
**4. ANTI-FRICTION BEARINGS** on rotor shafts make substantial cumulative savings in operating cost, reduce maintenance, keep rotor shafts in "fixed" alignment.

**5. FORCED FLOOD LUBRICATION** of bearings insures their proper maintenance automatically, contributing to longer bearing life with original high efficiency maintained.

**6. EFFICIENT COOLING** over *all* surfaces in contact with the batch. Stocks requiring low temperature mixing are handled more efficiently on the Intermix because the chamber bodies, ends, gate and ram, as well as the rotors, are designed for effective cooling of stocks requiring low temperature mixing.

**7. RENEWABLE WEAR PLATES** at rotor ends can be removed quickly if replacement is ever necessary.

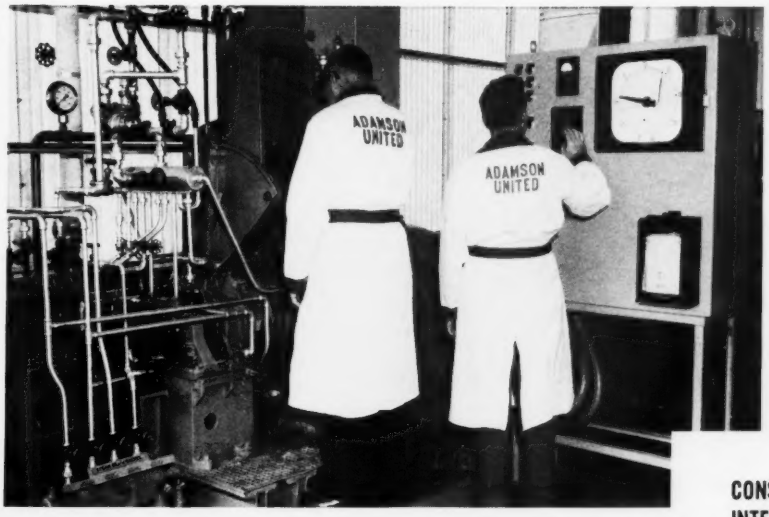
**8. DRIVES**—The Intermix is available with either a separately mounted Pinion Stand Drive, or with a bull gear type drive. The Pinion Stand Drive makes the Intermix more accessible for normal maintenance and offers longer gear train life. However, the lower cost bull gear drive is fully suitable for most compounds.



# ADAMSON UNITED

## OFFERS COMPLETE PROCESS ENGINEERING TO HELP YOU

- **TEST YOUR MATERIALS**
- **DETERMINE YOUR MIXING REQUIREMENTS**
- **PLAN YOUR INTERMIX INSTALLATIONS**




▲ Adamson United Company engineers and technicians work directly with the technical staffs of rubber manufacturers, assisting in compound evaluation, and development of Intermix plant installations. This partial view of the Adamson United processing laboratory shows a K-1 Intermix in operation.

In addition to our engineering and plant facilities for manufacturing the Intermix, we also maintain a processing laboratory, staffed and equipped, to assist rubber manufacturers in evaluating the Intermix in relation to their specific production requirements.

Here, with the assistance of experienced Adamson engineers and technicians, manufacturers can determine not only the performance capabilities of the Intermix, but also ascertain the production requirements of their compounds, test various mixes and materials, or experiment with new processing techniques and the development of new products. Complete privacy is assured where development projects are of a confidential nature.

Adamson engineers are thoroughly familiar with today's rubber processing problems. They are prepared to cooperate with your engineers on all phases of Intermix applications. They can recommend the size and type of Intermix that meets your mixing requirements, and help you plan your Intermix installations for highest operating efficiency.

**CONSIDER THE ADAMSON-SHAW INTERMIX FOR YOUR NEXT INTERNAL MIXER —**

You'll find it operating profitably for 97 companies, among which are:

**THE B. F. GOODRICH COMPANY, THE GENERAL TIRE & RUBBER CO., PIRELLI GENERAL, MARLEY TILE CO., DUNLOP TIRE AND RUBBER CO., BAKELITE CO., LEYLAND & BIRMINGHAM RUBBER CO.**

—in countries like these

*THE WORLD OVER . . .*

| | |
|---|---|
| ENGLAND | GERMANY |
| INDIA | FINLAND |
| CANADA | AUSTRIA |
| RUSSIA | ITALY |
| U.S.A. | SCOTLAND |
| FRANCE | CHINA |
| DENMARK | POLAND |
| SOUTH AFRICA | MOROCCO |
| TURKEY | HOLLAND |
| YUGOSLAVIA | SPAIN |
| | MALAYA |

The Shaw Intermix is being manufactured under license in the following countries:

HOLLAND ★ ITALY ★ FRANCE
AUSTRALIA ★ U. S. A.

SEE TABLE OF MACHINE SIZES AND BATCH WEIGHTS ON PAGE 4

# THE ADAMSON-SHAW **INTERMIX** IS AVAILABLE IN THE RIGHT SIZE AND DRIVE COMBINATION TO MEET YOUR MIXING REQUIREMENTS EFFICIENTLY AND ECONOMICALLY

## TABLE OF MACHINE SIZES AND BATCH WEIGHTS

| | Machine Size | K—0 | K—1 | K—2A | K—4 | K—5 | K—6 | K—7 |
|---|---|---|---|---|---|---|---|---|
| Approx. Batch Weight Lbs. | Crude Rubber | 11 ozs. | 5½ | 52 | 95 | 130 | 197 | 300 |
| | Specific Gravity 1 | ¾ | 6 | 55 | 100 | 138 | 205 | 320 |
| | Specific Gravity 1.3 | 1 | 7¾ | 72 | 130 | 180 | 270 | 420 |
| | Specific Gravity 2.0 | 1¾ | 12 | 110 | 200 | 276 | 410 | 640 |
| Net Volume Chamber | Cubic Inches | 60 | 270 | 2,854 | 4,200 | 6,800 | 9,792 | 16,213 |
| | Gallons | .26 | 1.3 | 3.96 | 18.23 | 29.6 | 42.53 | 70.26 |
| Motor Horse Power* | Bull Gear Drive Single Speed | 5 HP | 50 HP | 75 or 150 | 125 or 250 | 150 or 300 | 200 or 400 | 250 or 500 |
| | Bull Gear Drive Two Speed | | Variable | 75—150 | 125—250 | 150—300 | 200—400 | 250—500 |
| | Unit Drive Single Speed | 5 10 HP | Speed | 150 or 200 | 250 or 300 | 300 or 400 | 500 or 700 | 800 or 1000 |
| | Unit Drive Two Speed | | Drive | 100—200 | 150—300 | 200—400 | 350—700 | 500—1000 |
| Rotor Speeds RPM | Bull Gear Drive Single Speed | 76 | 45 145 | 16 or 33 | 16 or 33 | 16 or 33 | 16 or 33 | 16 or 33 |
| | Bull Gear Drive Two Speed | 72 150 | Variable | 16—33 | 16—33 | 16—33 | 16—33 | 16—33 |
| | Unit Drive Single Speed | | Speed | 33 or 44 | 33 or 44 | 33 or 44 | 33 or 44 | 33 or 44 |
| | Unit Drive Two Speed | | Drive | 22—44 | 22—44 | 22—44 | 22—44 | 22—44 |
| Approx. Overall Dimensions | Bull Gear Drive | 5′6″ x 2′6″ x 7′0″ Geared Motor | 14′6″ x 4′0″ x 6′6″ | 16′0″ x 8′6″ x 13′6″ | 23′0″ x 8′0″ x 15′6″ | 23′6″ x 11′0″ x 16′0″ | 28′6″ x 13′6″ x 20′0″ | 35′0″ x 12′0″ x 23′0″ |
| Length x Width x Height | Unit Drive | | | 16′0″ x 8′6″ x 15′6″ | 25′0″ x 8′0″ x 15′6″ | 26′0″ x 10′0″ x 16′0″ | 30′0″ x 15′0″ x 20′6″ | 38′6″ x 19′0″ x 23′0″ |
| Approx. Net Weight in Lbs. excluding Motor | Bull Gear Drive | 2,500 | 9,000 | 24,000 | 44,000 | 62,500 | 105,000 | 140,000 |
| | Unit Drive | — | — | 28,000 | 50,000 | 76,000 | 125,000 | 152,500 |

*Motor speeds are 1150 for 22 or 44 R.P.M. rotor speeds and 870 for 33 R.P.M. rotor speeds.

**NOTES:**

Relation between Horse Power and Speed is dependent upon type of Compound being mixed.

The table shows typical speeds and horse power range. Various other speeds and corresponding horse powers can be supplied.

# ADAMSON UNITED COMPANY

**730 Carroll Street • Akron 4, Ohio**

**Subsidiary of United Engineering and Foundry Co.**

**PLANTS:** *PITTSBURGH* • VANDERGRIFT • WILMINGTON • YOUNGSTOWN • CANTON

## PRODUCTS

Mills
Refiners
Crackers
Washers
Rubber Sheeting & Coating Calenders
Plastic Film Calenders
Calender Windups

Complete Calender Accessory Equipment
Embossing Calenders
Pot Heaters
Vulcanizers
Autoclaves
Hydraulic Presses
Automatic Presses

Belt Presses
Compression Molding Presses
Transfer Molding Presses
Injection Molding Presses
Laminating Presses
Hardboard Presses
Plywood Presses

Chipcore Machines
Rotocure Equipment
Auxiliary Equipment
Brake, Wheel and Tire Testing Machines
Special Heavy Machinery

DESIGNERS AND BUILDERS OF BASIC MACHINERY FOR THE RUBBER, PLASTICS AND PLYWOOD INDUSTRIES

*(Continued from page 132)*

Studies on high horsepower mixing using normal and reversed sequences in loading at the beginning of the cycle, when tread and carcass stocks are being prepared, showed that the two systems give similar mixing rates; but the reverse method is recommended for stocks with carbon blacks which tend to cake.

The studies lead to the conclusion that when all materials are loaded at the beginning of the cycle and upper ram pressure is increased, optimum and uniform properties are obtained after mixing 5-6.5 minutes (depending on type of stock).

In general, rate of mixing depends on the power and is proportional to it; while mixing time depends on the energy used under given conditions.

## New Plants for India

Soon three, possibly four, new reclaiming plants will be set up in India to help meet the growing shortage of rubber. The government has sanctioned schemes involving a factory, in Delhi, with annual output of 1,000 tons of reclaim, another with equal capacity in Coimbatore, and a third at Bombay for 5,000 tons. A fourth plant may also be planned for Calcutta.

At present Dunlop and Bata produce about 2,500 tons of reclaim annually for their own consumption.

A Norwegian process for producing sulfur from pyrites is being considered in plans for the manufacture of sulfur in India, according to reports. Large quantities of pyrites ore are available in Bihar State, and the economics of a project are being studied. India now imports her sulfur requirements of about 120,000 tons annually.

## Acid Salt Activation

Studies on the accelerating effect of potassium, sodium, and ammonium salts of organic acids are reported by A. S. Kuzminskii and others.[1]

The strongest activator proved to be ammonium benzoate—a white powder which has a specific gravity of 1.26 and has a slight odor. It is soluble in water and ethyl alcohol (when heated). Added to natural and butadiene acrylonitrile rubbers in the proportion of 0.5-1.5 parts by weight and with simultaneous adjustment of accelerator in certain cases, ammonium benzoate reduces optimum cure time to half or a third; it is slightly less effective with butadiene styrene rubbers. It does not affect mechanical properties or increase scorch tendency; stock prepared with it has a fairly broad vulcanization plateau.

[1] *Soviet Rubber Tech.*, Mar., 1960, p. 30.

Used alone, ammonium benzoate is a fairly weak accelerator, but it activates such organic accelerators as MBT, MBTS, TMTD, also in absence of sulfur. When ammonium benzoate was used together with MBT or MBTS, sulfur-free vulcanizates of butadiene acrylonitrile and butadiene styrene were obtained with mechanical properties similar to those of standard vulcanizates, but with far superior heat aging.

It is suggested that the alkaline properties of the ammonia evolved during vulcanization are largely responsible for the accelerating action of the salt. This theory seems to be confirmed by the fact that the ammonium benzoate apparently has no effect in sodium polybutadiene stocks or on basic accelerators or activators.

## Seen at Hannover Fair

Among interesting developments by German firms shown at the Hannover Fair (April 24-May 3, 1960) were new silicone products of Wacker Chemie G.m.b.H., Munich, including silicone rubber polymers which quickly absorb fillers, giving compounds easily mixed and extruded; a silicone compound still easily processable 20 hours after mixing; a green silicone grease superior to mineral grease even at 130° C.; and a highly notch-resistant cold vulcanizing type of silicone rubber. Featured, too, was an armored cable in which the silicone rubber-insulated conductors were embedded in silicone rubber foam, thus combining maximum stability, heat resistance, and low weight.

Among other applications of silicone rubber may be mentioned silicone-rubber-coated fabrics for covering operating tables and for other hospital purposes, displayed by the Degussa concern.

The Struktol line of processing aids for natural and synthetic rubber, shown by Schill and Seilacher, Chemische Fabrik, Hamburg, included the newest development—Struktol-Cum, said to make it possible to produce mixes of synthetic cold rubber and light-colored reinforcing materials having curing properties hitherto only obtainable with the combination natural rubber/synthetic rubber and high-quality carbon blacks.

Different types of swing doors for factories and the like were shown by the Continental Gummi Werke A.G., and by Oskar Meyer & Co., Essen. The former firm used transparent PVC; the latter had three styles on view—rubber doors with Plexiglas windows; a door entirely made of transparent plastics sheet, and a door with the upper half of glass-clear plastics sheet and the lower half of rubber, the whole framed in rubber channeling.

Mention may also be made of the tire repair material, Vulc-Compound put out by Stahlgruber Otto Gruber & Co., Munich, which does not require heated molds for vulcanizing and is claimed not to exceed shore hardness 65 even after several thousands of kms. on the road.

## Tire Cord Latex Dip

The main factors determining the best type of butadiene-styrene latex for dipping tire cord have been studied by A. B. Peizner and others,[1] leading to the development of a latex system claimed to give increased rubber-to-cord bond strength, greater durability of tires in bench tests, and greater mileage in actual use. This latex includes butadiene/styrene in the ratio 70:30 in the initial polymerization mixture; soaps of synthetic fatty acids or of hydrogenated rosin, as emulsifying agent; sufficient modifier to give a polymer with Defo value of 1,500-3,000 grams. A polymerization temperature of 20° C. is used with degree of monomer conversion of 60%. This latex, designated SKS-30 ShKhP, is said to be far superior to latex SKS-30Sh, an intermediate product of the preparation of the copolymer rubber.

[1] *Soviet Rubber Tech.*, May, 1960, p. 11.

## Polyisoprene Curing

Studies on the possibility of vulcanizing polyisoprene rubbers at temperatures above 143° C. (290° F.) without reducing tensile strength, despite the occurrence of breakdown of vulcanization bonds, have been reported by A. G. Shvartz and G. N. Buiko.[1]

Tests on pure gum and channel black polyisoprene vulcanizates prepared with different amounts of sulfur and accelerator, 3 parts (by weight) of ZnO and 2 of stearic acid, indicated that in pure gum vulcanizates which at optimum cure of 133-143° C. (271-290° F.), have cross-link density greater than $4.0 \times 10^{19}$ $cm^{-3}$; tensile strength increases from 25-35 to 140-200 $kg/cm^2$ (350-500 to 2000-2850 $lb/in^2$) as vulcanization is raised from 133 to 173° C. (271 to 345° F.). But when the degree of cross-linking is lower than the optimum figure given, tensile strength decreases with rising curing temperature. Similar results were obtained for the filled vulcanizates. The vulcanization plateau of rubbers having denser cross-link networks also varies less with increased curing temperature.

The mechanisms involved in the increase in tensile strength following breakdown of the network are explained. Tests on tire compounds prepared on the basis of the foregoing findings.

*(Continued on page 151)*

[1] *Soviet Rubber Tech.*, May, 1960, p. 3.

# market reviews

## Synthetic Rubber

Unless consumption of synthetic rubber in the six Common Market countries of Europe increases markedly in the next year or two, United States exports to the six are likely to drop sharply.

The reason is a sizable increase in western Europe's production facilities. Synthetic rubber production capacity in the Common Market nations, only 122,000 tons at the end of last year, will be up to 395,000 tons by the end of 1961. Unless consumption rises above last year's level of 191,000 tons the area should have a surplus for export.

Last year the Common Market countries actually produced 95,200 tons of synthetic, or 78% of capacity. This was more than double the previous year's total and more than eight times that of 1957. Since 1951 total rubber consumption in the Common Market has risen about 80%.

In that period consumption of natural rubber rose 28%, reclaim 75%, and synthetic 1,000%. Synthetic now makes up 33% of new rubber consumption in the six countries. It is not a complete competitor for natural rubber, since only about 40% of manufacturing facilities are able to substitute one for another.

U. S. manufacturers exported 290,468 long tons of synthetic rubber last year, more than 20% of total production of 1,379,652 long tons. Of this amount, 95,200 tons went to the Common Market six.

In Germany the Bunawerke Hols plant at Marl is raising capacity from 45,000 to 120,000 tons, and the Bayer plant at Leverkusen is going up from 12,000 to 30,000 tons. In France the 20,000-ton-capacity Socabu plant started last year, and the 40,000-ton Firestone plant and 10,000-ton Ungine plant plus the 50,000-ton Société des Elastomeres de Synthese will be ready next year. In Italy production is being raised from 40,000 to 70,000 tons.

The export situation elsewhere may also become more difficult. In Japan the two domestic manufacturers announced a 6% cut in SBR prices, designed to move domestic rubber. Japan now imports about 5,000 tons of synthetic rubber monthly, enough to cover all synthetic needs within the country. Domestic output was 3,000 tons in June.

Apparently the price cut was used as an alternative to a suggested 10 to 15% import duty on synthetic rubbers. The Japan Rubber Manufacturers Association opposed duties on grounds that other countries might raise import duties on Japanese goods, particularly rubber articles.

Consumption of new rubber in the United States for August was 125,409 long tons, compared with 114,642 long tons in July, according to the monthly report of The Rubber Manufacturers Association, Inc.

Synthetic rubber consumption in August was 88,088 long tons, compared with 79,413 long tons in July. The ratio of synthetic rubber consumption to total new rubber consumption was 70.24% (a new high), compared with 69.27% (the previous high) in July.

Consumption (in long tons) by type in August was: SBR, 73,305, against 67,853 in July; CR, 7,250, against 4,936 in July; IIR, 4,880, against 4,597; and NBR 2,653, against 2,027.

Synthetic rubber exports for August totaled 28,475 long tons, compared with 28,575 long tons in July. Total stocks in August reached 241,694 long tons, compared with 235,693 long tons in July.

Black masterbatch production in August was 4,584 long tons, against 5,728 in July; oil black masterbatch 18,846 tons, against 19,747, and oil masterbatch 39,419 tons, against 36,242 tons in July.

## Natural Rubber

Prices of natural rubber appeared to have firmed somewhat during the August 16-September 15 period, although the market remained fitful. The price of nearby rubber dropped to 33.8¢ on September 8, lowest price since June, 1959; prices, however, staged a recovery and finished the period at 34.75¢, compared with 36.65¢ at the end of the previous period.

Although some circles feel that prices have stabilized, many analysts refuse to predict that they have hit bottom. Prices are still reasonably high, especially compared with prices of synthetics. The reaction abroad is still pessimistic, since the failure of U. S. business to hit the peaks predicted for it is considered a sign of weakness. The sharp drop of U. S. new rubber consumption in July, to 114,642 tons from 138,425 tons in June, has brought warnings that the slow summer may turn into a moderate recession. Reaction of the public to the 1961 car models will probably tell some of the story.

The feeling is growing that Russian buying cannot be expected to push up prices, since many observers are convinced that the Russians have been doing their buying all along, purchasing quietly in small lots in order to keep prices down. In that case, no big new orders can be looked for.

August sales on the New York Commodity Exchange amounted to 9,600 long tons, compared with 15,350 during July. There were 23 trading days in August, and 22 in the July 16-August 15 period.

On the physical market, according to the Rubber Trade Association of New York, RSS #1 averaged 36.78¢ a pound for August and 35.73¢ for the August 16-September 15 period. Average August sellers' prices for the representative grades were RSS #3, 36.14¢, Amber Blankets, 30.85¢, and Flat Bark, 25.21¢.

REX CONTRACT

| 1960 | Aug. 19 | Aug. 26 | Sept. 2 | Sept. 9 |
|---|---|---|---|---|
| Sept. | 36.55 | 36.10 | 35.60 | 34.40 |
| Nov. | 33.80 | 33.75 | 34.35 | 33.90 |
| 1961 | | | | |
| Jan. | 33.05 | 32.75 | 33.60 | 33.30 |
| Mar. | 32.75 | 32.25 | 33.00 | 32.90 |
| May | 32.50 | 32.00 | 32.60 | 32.60 |
| July | 32.25 | 31.80 | 32.20 | 32.45 |
| Sept. | 32.00 | 31.60 | 31.80 | 32.35 |

NEW YORK OUTSIDE MARKET

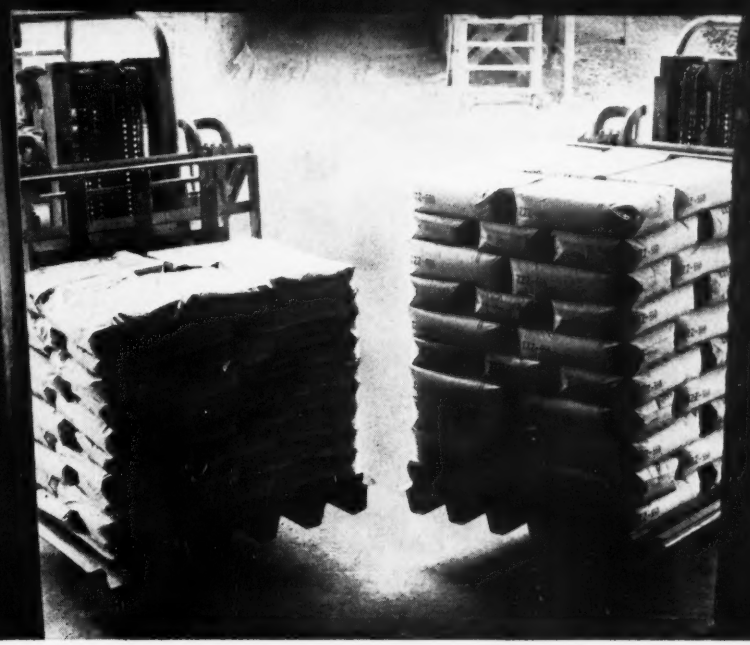
| 1960 | Aug. 19 | Aug. 26 | Sept. 2 | Sept. 9 |
|---|---|---|---|---|
| RSS #1 | 36.00 | 35.75 | 35.13 | 34.38 |
| #2 | 35.75 | 35.50 | 35.00 | 34.13 |
| #3 | 35.50 | 35.25 | 34.75 | 34.00 |
| Pale Crepe | | | | |
| #1 Thick | 39.00 | 37.25 | 37.75 | 36.75 |
| Thin | 39.00 | 37.25 | 37.75 | 36.75 |
| #3 Amber Blankets | 30.75 | 29.50 | 29.25 | 28.38 |
| #3 Thin Brown Crepe | 30.75 | 29.50 | 29.25 | 28.38 |
| Standard Flat Bark | 22.75 | 22.85 | 23.25 | 23.25 |

## Latex

The drum latex market was very quiet during the August 16-September 15 period. What scattered buying interest there was did not halt the downward movement in the differential. Bulk latex has remained very quiet for some months.

# Now you can greatly increase warehouse space at no increase in cost with...

# AZODOX high apparent density zinc oxides



- Easier to Handle
- Stacks Higher, Safely
- Less Bag Breakage
- Close-Packed, Unitized Shipments

**AZODOX** stores in much less space than other zinc oxides. That's because you get many more pounds of AZODOX per cubic foot of pigment—up to 62 lbs. per cubic foot! Save valuable space for other purposes with every ton of AZODOX you buy.

In the manufacture of AZODOX, an exclusive process removes excess, space-wasting air from between individual particles of zinc oxide. Actual pigment density and every other desirable property remain unchanged. High apparent density AZODOX flows freely yet dusts less, incorporates fast and disperses thoroughly.

**AZODOX** is available in the following grades at no additional cost over conventional zinc oxides:

| | Bulk Density lbs./cu. ft. | Rate of Activation | Reinforcement Properties |
|---|---|---|---|
| AZODOX-44 (Conventional) | 60 | Medium | High |
| AZODOX-55 (Conventional) | 60 | Fast | High |
| AZODOX-55-TT (Surface Treated) | 62 | Fast | High |
| AZODOX-550 (Conventional) | 58 | Medium | High |

***For technical data, fill in and mail this coupon.***

AMERICAN ZINC SALES COMPANY
**1515 Paul Brown Bldg., St. Louis 1, Mo.**

Please send me technical information about...

- ☐ AZODOX-44
- ☐ AZODOX-55
- ☐ AZODOX-55-TT
- ☐ AZODOX-550
- ☐ 15 types of AZO brand zinc oxides

Name.....Title.....
Company.....
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American Zinc sales company

*Distributors for*
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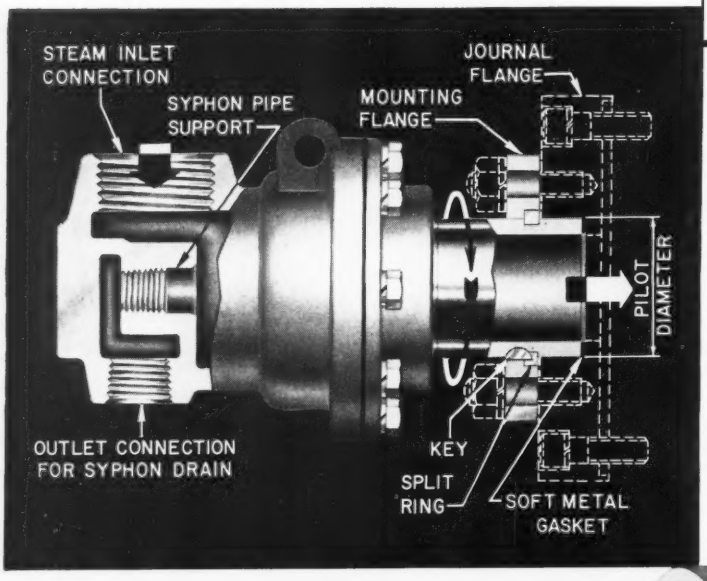
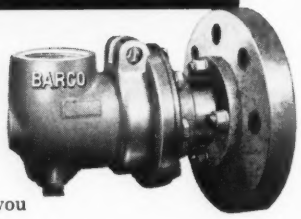
*Designed for*

**EASY INSTALLATION**

and accurate control of concentricity




**2"–2½"–3" sizes with FLANGE CONNECTIONS**




HERE is the rotary joint by Barco that gives you everything you want in design and performance:

**EASY INSTALLATION**—Only an end wrench is required to draw up or loosen four nuts on the mounting flange studs for installation or easy removal of joint.

**TIGHT SEAL**—No pipe thread dope required for sealing. End of rotating sleeve seats against soft metal gasket.

**CONTROLLED CONCENTRICITY**—NO rotating "wobble". Accurate pilot diameter on sleeve establishes and holds concentricity.

**WIDE SPACED BEARINGS**—Two, instead of one . . . increased bearing area. No lubrication required. Lowest friction. Bearings heat shrunk in place under compression for greater strength.

**RESISTS SEAL RING BREAKAGE**—The spherical seal ring is under compressive, not tensile, loading. Self-adjusting for wear. Seal withstands shock loads and alternating hot and cold service.

**200 P. S. I. STEAM RATING**—Super duty performance at *no extra cost*. Suitable for either single flow or syphon flow service . . . one basic seal for steam, air, water, oil, gas. For temperatures to 450°F. or up to 600°F. under certain conditions.

**ENGINEERING RECOMMENDATIONS**—Barco will be glad to furnish you with detailed information, including dimensions and specifications for flanges. ASK FOR CATALOG SHEET 331.

**NEW BARCO TYPE CF Rotary Joint**

*for*

**RUBBER PLANTS**

**MIXERS, MILLS, EXTRUDERS, CALENDERS**

**BARCO MANUFACTURING CO.**

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FOUNDED 1908 BARCO PRODUCTS BACKED BY EXPERIENCE

*The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Rotating Joints*

In Canada: The Holden Co., Ltd., Montreal

# market reviews

Prices for ASTM centrifuged concentrated natural latex, in tank-car quantitites, f.o.b. tank-car, were down to 41.52¢ per pound solids, compared with 42.29¢ the month before. Synthetic latices prices remained unchanged: 26 to 40.24¢ for SBR; 37 to 57¢ for CR; and 45 to 60¢ for NBR.

(All figures in long tons, dry weight)

| Type of Latex | Production | Imports | Consumption | Month-End Stocks |
|---|---|---|---|---|
| Natural | | | | |
| June | 9 | 3,335 | 3,975 | 14,140 |
| July | 0 | * | 2,912 | 14,785 |
| SBR | | | | |
| June | 7,541 | —— | 7,147 | 9,142 |
| July | 6,481 | —— | 5,433 | 9,364 |
| Neoprene | | | | |
| June | 965 | 0 | 1,033 | 1,530 |
| July | 953 | 0 | 729 | 1,564 |
| Nitrile | | | | |
| June | 973 | 0 | 981 | 1,941 |
| July | 983 | 0 | 780 | 2,064 |

*Not available yet for period covered.

## Scrap Rubber

The scrap rubber market was very quiet during the August 16-September 15 period. Although a rise in activity had been expected after Labor Day, with reclaim plants open again after vacation shutdowns, no rise was forthcoming.

Scrap rubber prices held at previously quoted levels, with mixed auto tires at $7 to $12 in the East, the high side of the range only applicable on shipments to Buffalo, and $11 at midwestern points.

| | Eastern Points | Akron, O. |
|---|---|---|
| | Per Net Ton | |
| Mixed auto tires | $7.00/$12.00 | $11.00 |
| S.A.G. truck tires | nom. | nom. |
| Peeling, No. 1 | nom. | 33.00 |
| 2 | nom. | nom. |
| 3 | nom. | nom. |
| | (¢ per Lb.) | |
| Auto tubes, mixed | 5.00 | 5.00 |
| Black | 5.75 | 5.50 |
| Red | nom. | nom. |
| Butyl | 7.25 | 7.25 |

## Reclaimed Rubber

The reclaimed rubber market remained slow during the August 16-September 15 period, partially because of August vacations at a number of replacement tire companies, reclaim manufacturers reported. Reclaim firms were hopeful that business would pick up when auto manufacturers began full production on their 1961 models.

According to The Rubber Manufacturers Association, Inc., reclaimed rubber consumption for August reached 21,385 long tons, against 19,249 long tons in July. Production hit 23,535 long tons, compared with 21,472 in

The officers and directors of Stewart Bolling & Company, Inc., pledge to continue the policies of the founder. We will continue to serve the rubber and plastics industries with the quality of product and service which has become associated with the company since its founding 35 years ago.

The present officers contemplate no change whatever in ownership, nor is there any thought of merging the facilities, physical or personnel, with those of any other organizations competing with or complementing the present lines of equipment made by Stewart Bolling & Company, Inc.

Our intention is to improve and expand the facilities of Stewart Bolling & Company in every practical manner and degree.

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*Vice-President and Sales Manager*

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*Director of Engineering*

THADDEUS SOBIERAJ
*Plant Superintendent*


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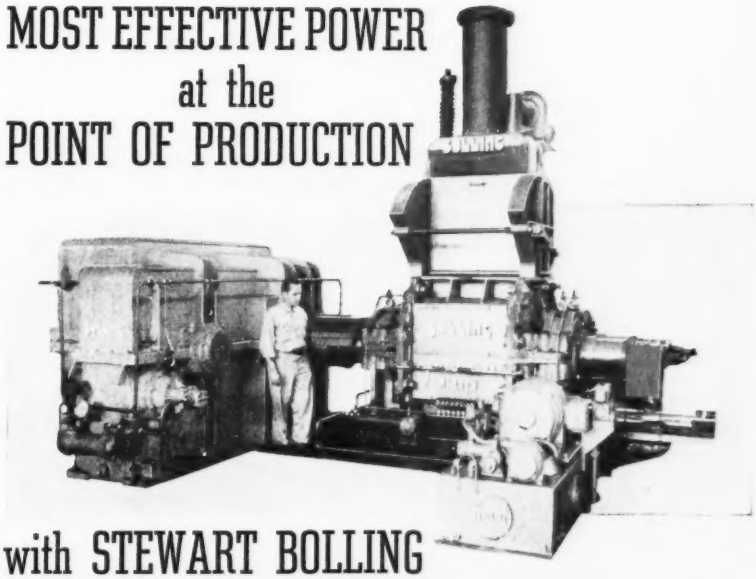
at the
POINT OF PRODUCTION



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SPIRAL-FLOW INTENSIVE MIXERS

Stewart Bolling

*AVAILABLE FEATURES:*

Variable friction ratios

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Choice of 3 types of drives

• • •

Choice of 3 types of discharge doors

• • •

Chrome-plated interiors

More power in a Spiral-Flow mixer means the best in technical application of increased horsepower. Stewart Bolling offers three drives which will most effectively increase production.

Bolling compound drives transmit horsepower directly to both rotors. Anti-friction roller bearings eliminate loss of power, and also prevent end zone movement, wear, and by-passing. For these reasons and because of other design exclusives, Stewart Bolling mixers can take higher horsepowers, faster rotor speeds and increased chamber pressures. Bolling compound drives, furthermore, operate with little noise and vibration, and eliminate the sources of gear wear.

Thus, increased tonnages are arrived at by technical achievements—not merely by applying faster motors. Stewart Bolling's variety of drives makes Spiral-Flow Intensive Mixers a complete new concept in plastics and rubber production.

**Stewart Bolling**
& Company, Inc.

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*Designers and Builders of Machinery for the Rubber and Plastics Industries*

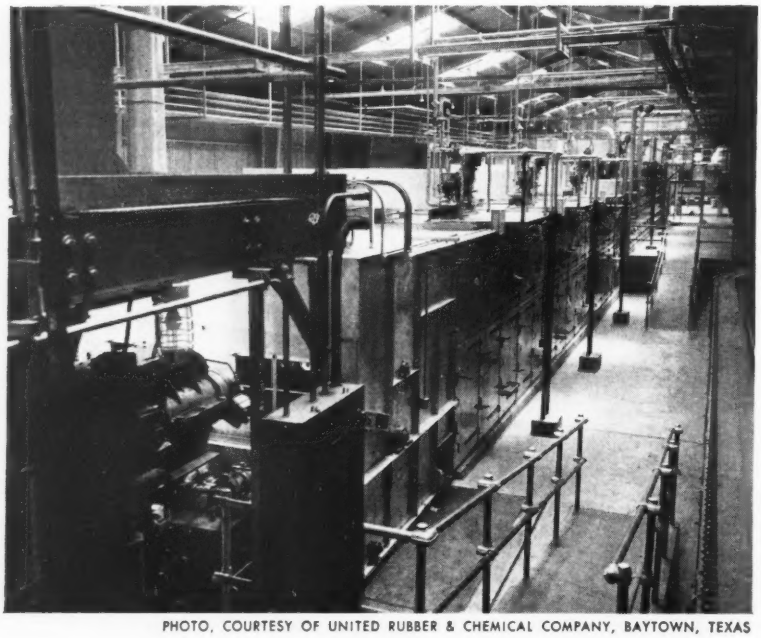
Intensive Mixers • Calenders • Mills • Refiners • Crackers • Dust Grinders • Sheeters
Hydraulic Presses • Pump Units • Accumulators • Elevators • Bale Splitters • Vulcanizers
Speed Reducers • Gears • Extruders

Generally, there are three approaches by a company to the selection of a process dryer — the engineering, the economic, and the important evaluation of the intangibles. We firmly believe that SARGENT will always be found on top from every approach, for many reasons, an important one being that our machines and our people consistently deliver as promised, and more. This is the SARGENT:

- A dryer designed for your process, your required production.
- Rugged construction, trouble-free economical operation.
- Highest quality, measurably uniform drying.
- Exclusive features for efficiency and safety.
- Heat source — gas, oil, steam, electricity.
- A dryer designed for quick, easy cleanout.
- The bonus economy of the speediest, easiest installation of any machine on the market.
- Built by a company whose dryers lead the field — a company whose long experience makes a guarantee really mean something — a company that will say, "We stand unequivocally behind every machine we build."

**FORMULA FOR PROFITABLE OPERATION**

# RUBBER DRYERS by SARGENT



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**SARGENT Single-Pass, Two-Stage Rubber Dryer**

This 32-section, 2-stage master batch dryer, delivering large tonnage hourly, has a vibrating feeder, an extra-wide conveyor. Gas-fired, with each of six zones separately heated, regulated and controlled. No air recirculation through the heaters prevents contamination. Full-height hinged doors for ease of speedy, thorough cleanout. Completely automatic push-button operation and control. It meets fully the exacting, specified requirements of hourly production with complete automation, operating efficiency and the incorporation of every known safety device for the protection of personnel, machine and stock.

Another example of SARGENT advanced design and creative engineering in building a dryer that will be MODERN FOR YEARS TO COME.

**C. G. SARGENT'S SONS CORPORATION**

Graniteville, SINCE 1852 Massachusetts

PHILADELPHIA • CINCINNATI • CHARLOTTE • ATLANTA • HOUSTON • DETROIT
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## market reviews

July. Exports for August were 1,200 long tons, against 1,384 in July. Forty tons of reclaim were imported in July; the August figure is not yet available.

RECLAIMED RUBBER PRICES

| | |
|---|---|
| Whole tire, first line | $0.115 |
| Third line | .1075 |
| Inner tube, black | .17 |
| Red | .22 |
| Butyl | .17 |
| Light carcass | .22 |
| Mechanical, light-colored, medium gravity | .185 |
| Black, medium gravity | .10 |

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims, in each general group separately featuring characteristic properties of quality, workability, and specific gravity, at special prices.

## Industrial Fabrics

Although a fair number of releases came through in early September for industrial grey goods from coaters who serve the auto industry, industrial fabrics business continued quite sluggish during the August 16-September 15 period.

To a certain extent lack of business may have been a result of the determination of mills to maintain prices, since sales have been made for quick deliveries in comparatively small quantities, with an indication that inventories of buyers are quite low.

Instead of shaving prices, producers of industrial fabrics have cut back work schedules. Most of those on six-day schedules have cut back to four or five days a week. In several cases they have cut back to three days a week, and one mill shut down completely for a short period. Mill men say current inventories are not burdensome, and curtailments were made to keep pace with demand.

Nevertheless the slow market has caused some discrepancies between prices of various constructions, weights, and widths, not to mention between the same kinds of cloth. There was also a spread of as much as a couple of cents a yard between similar weights. Some lower grades sold at prices considerably below top grades.

**Industrial Fabrics**

**Drills***

| | | |
|---|---|---|
| 59-inch, 1.85, 68x40 | *yd.* | $0.39 /.395 |
| 2.25, 68 x 40 | | .30 /.335 |

**Broken Twills***

| | | |
|---|---|---|
| 54-inch, 1.14, 72x52 | *yd.* | .575/.58 |
| 58-inch, 1.06, 71x52 | | .62 /.625 |

**Osnaburgs***

| | |
|---|---|
| 59-inch, 2.35, 32x26 | .2825/.29 |
| 61-inch, 2.20, 38x28 | .305 |
| 62-inch, 2.23, 32x26 | .30 |

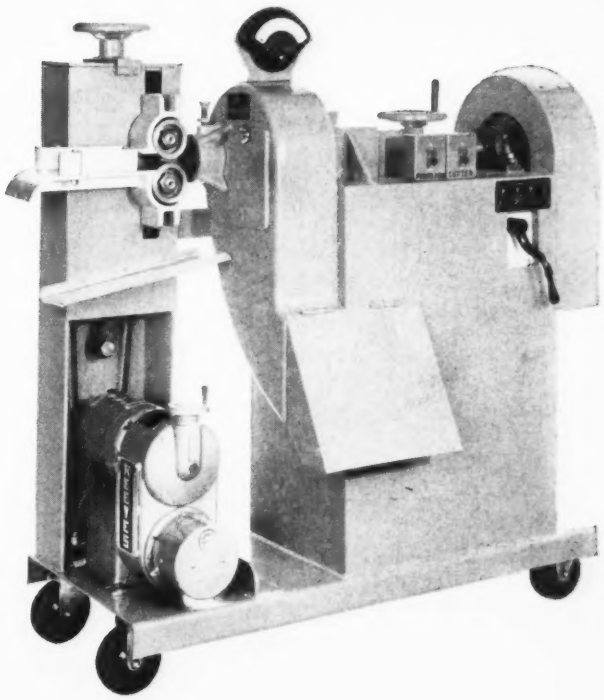
**Ducks**

**Numbered Duck†**

List less 45%

*New Gear Shift Model . . . Heavier Construction, Faster Size Changeovers!*

# GOODMAN
## RUBBER
# SLUG CUTTER



Size changeovers are faster than ever with the new Gear Shift Model Goodman Slug Cutter. Heavier (2390 lbs.), more rugged construction assures greater accuracy of slug weight during continuous production. Delivery rate increased to 50-1200 slugs per minute. Two models . . . with choice of slug lengths $\frac{3}{16}$" to 4", or $\frac{3}{16}$" to 12". Easily moved on swivel caster base, unit occupies only 60"x32" floor space. Stock capacity up to 3" dia., variable speeds 180-1800 in./min.

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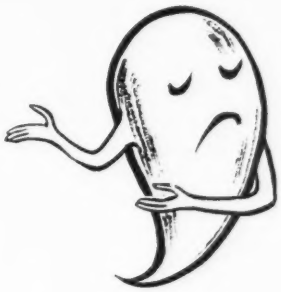
*"The Proven Accelerator-Activator"*
*Since 1944*

***For use with—***
**Thiazoles • Thiurams • Dithiocarbamates**



***Advantages—***

★ **Flat Modulus SB-R**
★ **Balanced Vulcanization with Mixtures SB-R and Natural Rubber**
★ **Superior Heat Aging**
★ **Halts Natural Rubber Reversion**
★ **Safe Processing**

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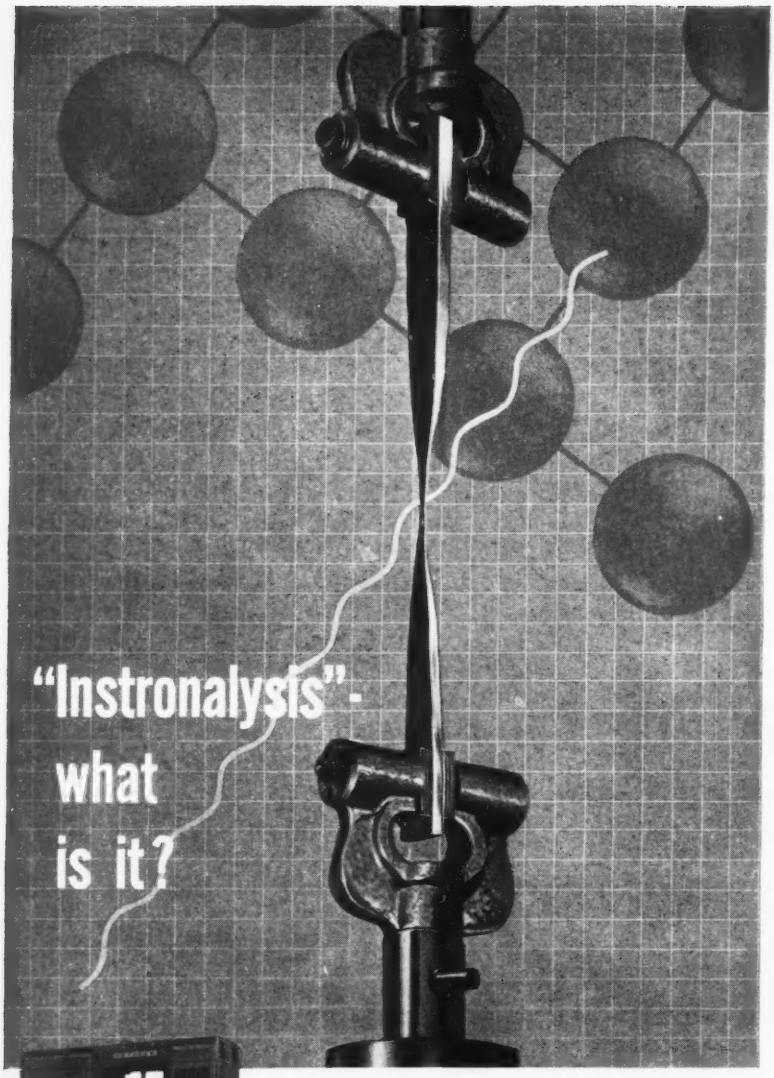
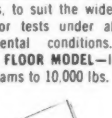
ADDRESS: .....



The Instron comes in various models and sizes, to suit the widest applications — for tests under all sorts of environmental conditions. ILLUSTRATED: **FLOOR MODEL**—load ranges from 2 grams to 10,000 lbs.



Interesting studies on the rheological properties of viscoelastic materials are available in Bulletin PC-2 and R-3. Reprints on many other fields of testing are also available for the asking.

"Instronalysis" means in-depth testing of materials with the Instron Universal Tester. You won't find the word in Webster's, but it is a term of importance to every laboratory concerned with modern testing techniques.

That's because today's technology demands nothing less than in-depth testing. Stress-strain curves alone are no longer adequate to measure the characteristics of long-chain molecular materials and other new "miracle" products. Today's tester must be able to determine the effect of different strain rates at various temperatures, energy loss under repeated cycling, stress relaxation and recovery, recoverable and unrecoverable creep, and many more characteristics beyond the scope of conventional equipment.

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# market reviews

**Enameling Ducks***

| | | S.F. | D.F. |
|---|---|---|---|
| 38-inch, 2.00 yd. | | $0.275 | $0.33 |
| 51.5-inch, 1.35 yd. | | .4738 | .4885 |
| 57-inch, 1.22 yd. | | .4838 | .50 |
| 72-inch, 1.05 yd. | | .6575 | .6765 |

**Hose and Belting Ducks***

| | | |
|---|---|---|
| Basis | lb. | .67 |

**Chafer Fabrics***

| | | |
|---|---|---|
| 14.40-oz/sq.yd. P.L. | lb. | .74 |
| 11.65-oz./sq.yd. S.Y. | | .65 |
| 10.80-oz./sq.yd. S.Y. | | .68 |
| 8.9-oz./sq.yd. S.Y. | | .70 |

**Sheeting***

| | | |
|---|---|---|
| 52-inch, 3.85, 48x48 | yd. | .235/.24 |
| 57-inch, 3.47, 48x48 | | .245/.25 |
| 60-inch, 2.10, 64x64 | | .38 |
| 2.40, 56x56 | | .335/.34 |

**Sateens***

| | | |
|---|---|---|
| 53-inch, 1.12, 96x60 | yd. | .6275 |
| 1.32, 96x64 | | .56 |
| 58-inch, 1.02, 96x60 | | .68 |
| 1.21, 96x64 | | .61 |

* Net 10 days.
† 2% 10 days.

## Rayon and Nylon

Celanese Mexicana, S.A., an affiliate of Celanese Corp. of America, plans to produce nylon tire cord in addition to its present production of high-tenacity rayon tire cord and fabric. Production at the Celanese plant in Toluca, Mexico, will begin early next year, with a capacity of 2,000 tons a year.

The plant was designed under an agreement with the Firestone Tire & Rubber Co. for its process and equipment design. With introduction of the new nylon cord, the Mexican tire industry will be able to fill all present tire cord requirements with Mexican cord.

During the same period Mohawk Rubber Co. announced that its entire truck tire production will be converted to nylon cord. Just a year ago the company announced an all-nylon passenger tire production.

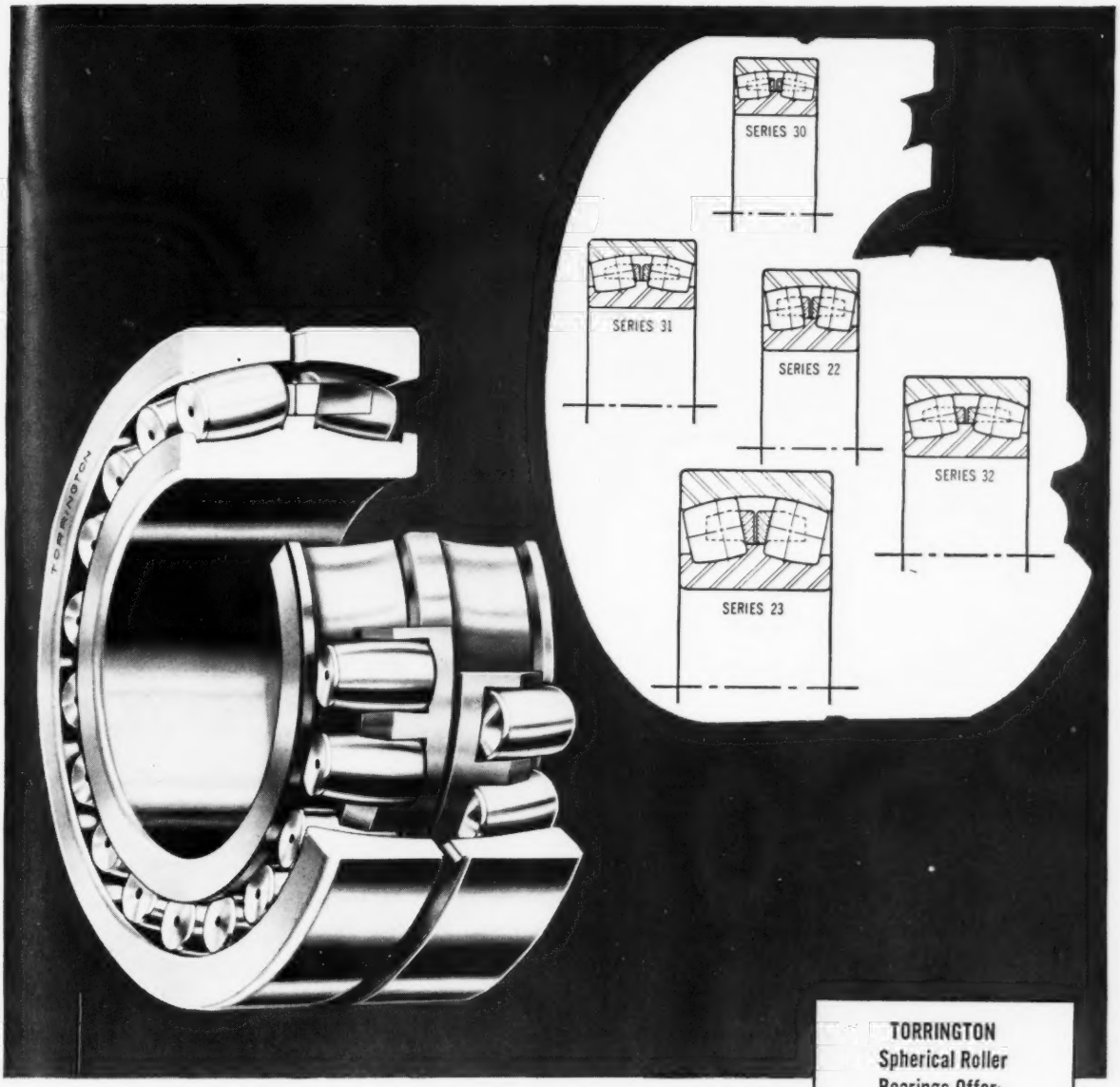
Until now Mohawk has been producing both nylon cord and rayon cord tires.

Despite Mohawk's announcement, however, high-viscosity rayon still has the greatest part of the original equipment market. Price cuts expected to be made by nylon manufacturers next year may change the picture.

Meanwhile, William Dalton, President of Tyrex, Inc., an association of makers of the Tyrex cord, told delegates to the annual convention of the National Tire Dealers & Retreaders Association in Kansas City that tires made with Tyrex cord are both longer wearing on original treads and as retreads. He added that truckers are switching to Tyrex cord tires because of longer wear.

Total packaged production of rayon

(*Continued on page 151*)

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Bearings matched *exactly* to the job pay off in better performance, longer life, greater reliability. That's why it pays to specify carefully. And that's why it pays to choose Torrington Spherical Roller Bearings.

Whatever your space limitations or capacity requirements, the five series of Torrington Spherical Roller Bearings provide the right bearing for virtually every industrial application. You can design for straight bore or tapered bore with adapter. You can benefit from extra features such as lubrication groove and oil holes, or selected outside diameters.

Your use of Torrington Spherical Roller Bearings will assure exceptional operation and longer bearing life under the toughest conditions. They're made to Torrington's own uncompromising standards—the highest in the field of anti-friction engineering—by the manufacturer of every basic type of anti-friction bearing.

**TORRINGTON Spherical Roller Bearings Offer:**

- conformity of rollers to raceways
- integral center guide flange for stability
- positive roller guidance
- land-riding bronze cages
- maximum radial and thrust capacity
- controlled internal clearance
- electronically selected rollers
- inherent self-alignment
- even load distribution
- long, dependable service life

Send for new Torrington Spherical Roller Bearing Catalog =258

*progress through precision* **TORRINGTON BEARINGS**

**THE TORRINGTON COMPANY** South Bend 21, Indiana • Torrington, Conn.

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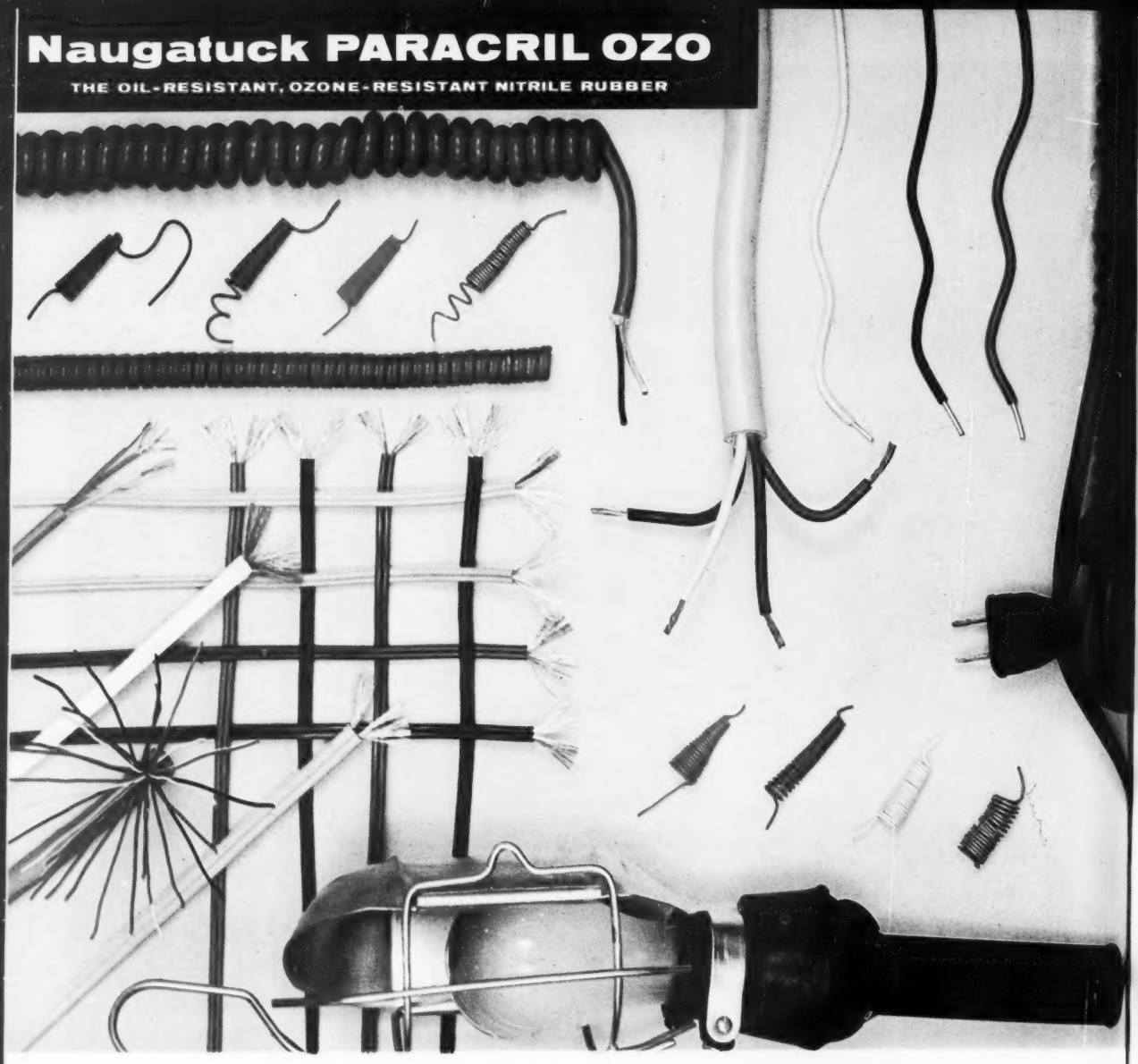
**THE OIL-RESISTANT, OZONE-RESISTANT NITRILE RUBBER**



## Great new advance in wire jacket rubber

Now you can give your wire and cable jacketing new resistance to cuts and abrasion, superior resistance to attack by oils and solvents, outstanding new resistance to weather and ozone . . . *and enjoy all the benefits of color, too.*

Color code for fast, unerring identification . . . color for smart, modern appearance . . . to call attention . . . to hide . . . to add solid new sales appeal. Because PARACRIL® OZO takes and retains any color you desire, permanently.

In addition to color, PARACRIL OZO offers such advantages as:

- significantly superior ozone resistance
- excellent resistance to fuels, oils, and solvents
- exceptional abrasion resistance
- high physical properties
- good flame resistance

Try new PARACRIL OZO. See why it offers makers and users of not only wire and cable jackets, but of rubber products by the hundreds a host of valuable new selling possibilities. For more information, for samples, for technical assistance with a present or proposed application, contact your Naugatuck representative or the address below today.

**Naugatuck Chemical**

**Division of United States Rubber Company** Dept. A Elm Street Naugatuck, Connecticut

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · CANADA: Naugatuck Chemicals Division, Dominion Rubber Co., Ltd., Elmira, Ontario · CABLE: Rubexport, N.Y.

# Naugatuck RECLAIM

# FINISHED?

No... just the *start* of a whole series of rubber products made faster, at less cost, and, in many ways, *better* than products made with raw rubber.

Reclaimed rubber offers *definite and proven* advantages over raw rubber in tires, tubes, mats, radiator hose, battery boxes, and an almost unlimited variety of molded products.

- **IMPROVED DIMENSIONAL STABILITY**—Reclaimed rubber compounds hold their shape better.
- **UNIFORM MATERIAL**—Rigid control of processing provides remarkable uniformity.
- **STABLE LOW COST**—Price of whole tire reclaim is about ⅓ that of natural rubber. And... it already contains many valuable additives.
- **SHORT MIXING TIME**—Because reclaimed rubber has, in a sense, been pre-mixed, mixing time is shorter, power costs are less.
- **LOW HEAT BUILD-UP**—Reclaimed rubber has less heat build-up during mixing and other operations.
- **HIGH RATE OF CURE**—Reclaimed rubber is faster curing than synthetic rubber, adding it to synthetic rubber increases the curing rate of the combination.
- **AGES WELL**—The reclaiming process stabilizes the hydrocarbon and minimizes reversion common to other rubbers.

To learn more about reclaimed rubber and how it can profit you, call your Naugatuck representative or write for free booklet, "Reclaimed Rubber."

**Naugatuck Chemical**

**Division of United States Rubber Company** 110R Elm Street Naugatuck, Connecticut

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CELOGEN®-AZ blown vinyl has gone high fashion . . . with the hand and drape of the very finest and most expensive kid leather.

CELOGEN-AZ, a specially developed chemical blowing agent gives vinyl sheeting a distinct new resilience, a new lightness, softness, and flowing flexibility that is making blown vinyl one of the fastest growing segments of the plastics industry. Alert manufacturers are capitalizing on blown vinyl's versatility for upholstery, luggage and handbags, ladies' coats and jackets, footwear, and an ever-increasing line of consumer and industrial applications.

CELOGEN-AZ imparts a uniformly fine cell structure with no undesirable side effects, no unpleasant odors. It may be used in extrusion, calendering, and spread-coating operations with complete processing safety. The consistently high quality of this product of the world's leader in chemical blowing agents has made it the outstanding such chemical for blown applications.

If you want to produce a finer, more salable vinyl product *and reduce your costs as well*, see your Naugatuck Chemical Representative or contact the address below.

**Naugatuck Chemical**

**Division of United States Rubber Company** Dept. A Elm Street Naugatuck, Connecticut

US RUBBER

Rubber Chemicals · Synthetic Rubber · Plastics · Agricultural Chemicals · Reclaimed Rubber · Latices · **CANADA**: Naugatuck Chemicals Division Dominion Rubber Co. Ltd. Elmira, Ontario · **CABLE**: Rubexport N.Y.

# market reviews

(*Continued from page 146*)

and acetate filament yarn during August was 55 million pounds, including 32 million pounds of regular-tenacity yarn and 23 million pounds of high-tenacity. The July total was 53.3 million pounds, including 30.8 million pounds of regular-tenacity and 22.5 million pounds of high-tenacity.

Filament stocks at the end of August were 65.5 million pounds, compared with 62.8 million pounds at the end of July. The August breakdown was 45.1 million pounds of regular-tenacity yarn and 20.4 million pounds of high-tenacity, compared with 43 million pounds of regular-tenacity and 19.8 million pounds of high-tenacity in July.

August shipments were 49.9 million pounds of yarn including 29.3 million pounds of regular-tenacity and 20.6 million pounds of high-tenacity. July shipments were 45.9 million pounds, including 26 million pounds of regular-tenacity and 19.9 million pounds of high-tenacity.

RAYON PRICES

**Tire Fabrics**

| | |
|---|---|
| 1100/980 | $0.69 |
| 1650/980 | $0.58/.615 |
| 1650/1500 | .59/.625 |

**Tire Yarns**

| | |
|---|---|
| High-Tenacity | |
| 1100/ 490 | .535 |
| 1100/ 980 | .545 |
| 1150/ 490, 980 | .535 |
| 1230/ 490 | .535 |
| 1650/ 980 | .465 |
| 1875/ 980 | .465/.475 |
| 2200/ 980 | .455 |
| Super-High Tenacity | |
| 1650/ 720 | .475/.565 |

NYLON PRICES

**Tire Yarns**

| | |
|---|---|
| 840/140 | .92/ .94 |
| 1680/280 | .89/ .92 |

■

# news from abroad

(*Continued from page 139*)

showed that properties of rubbers cured at 163° C. (325° F.) are not inferior to those of the usual rubbers vulcanized at 138° C. (280° F.). It is therefore considered that a more powerful vulcanization system must be used for high-temperature curing of polyisoprene rubber tires.

## Ceylon Exports Up

High rubber prices have sent Ceylon's rubber business booming. Exports during the first four months of the current year came to 103,500,000 pounds valued at Rs. 173,300,000, showing an increase of 30% in quantity and almost 46% in value, as compared with exports for the same period last year. Rubber production, too, was up and at nearly 77,000,000 pounds for the first third of 1960 was 40% higher than in the corresponding 1959 period.

The Chinese were not in the market at all during the period considered, but Russia started large-scale purchases and took 6,000,000 pounds of Ceylon rubber in April, the *Ceylon News* reports.

## IR Pushed in USSR

A study which took place in the USSR has led to the same conclusions which have been instrumental in creating the polyisoprene and polybutadiene programs in the U. S.: namely, that none of the existing modifications of SBR polymers can completely replace natural rubber in those items such as truck tires or other products which need the properties of natural rubber for optimum wear or service life.

F. J. Yashunskaya and G. A. Markovich conclude, in the report of their work,[1] that particularly in the USSR with 80% of tire production being in the truck, agricultural, and heavy-duty off-the-road types, much emphasis must be put into development of the stereo-regular rubbers besides the announced plans to change general-purpose rubber production emphasis from the present sodium rubbers to SBR types.

The need of replacement of natural rubber by a man-made substitute is more necessary, therefore, in the USSR in the event of a natural shortage than in the U. S. with its tire production of 85% car and light-truck types which can be made from all SBR compounds.

While the program reported upon in this article covered a comparison of SBR with many other highly elastic synthetic rubbers, only polyisoprene has been adequately tested in Russia and developed suitably for commercial production, leading the authors to urge that plants for its production be constructed and put in operation soon.

[1] *Soviet Rubber Tech.*, Apr., 1960, p. 2.

## Correction

In the August issue of RUBBER WORLD on page 16 the Natural Rubber Development Board and the Natural Rubber Producers' Research Association were incorrectly identified as the National Rubber Development Board and the National Rubber Producers' Research Association, respectively.

## Pelletized News

**PHOENIX GUMMIWERKE, Hamburg-Harburg, Germany, has decided to enter into close commercial and technical collaboration with the French group of Société Industrie du Caoutchouc Souple S.A. (I.C.S.),** Pont-de-Cheruy, France, in all branches except tires. Phoenix, which has ties with

**In Vinyl Foam Coated Fabrics It's**

**CELOGEN®-AZ**

**For... Uniform Blow**
**...Uniform Quality**
**...Dependable Supply**

Here is a typical starting-point formulation for calendering:

| | |
|---|---|
| MARVINOL VR-31 | 100 parts |
| Dioctyl phthalate | 70 |
| Butyl benzyl phthalate | 30 |
| Stabilizer | 3 |
| CELOGEN-AZ | 5 |
| Stearic acid | 0.5 |

Ingredients are preblended, Banbury-mixed and calendered using conventional equipment and techniques, excepting that stock temperatures are kept below 300° F. Expansion is accomplished by passing the sheet or laminate through an oven set at or above the blowing temperature of the compound, about 380° F.

For spread coating the following starting-point recipe is suggested:

| | |
|---|---|
| MARVINOL VR-50 or VR-53 | 100 parts |
| Dioctyl phthalate | 70 |
| Butyl benzyl phthalate | 30 |
| Stabilizer | 3 |
| CELOGEN-AZ | 4 |

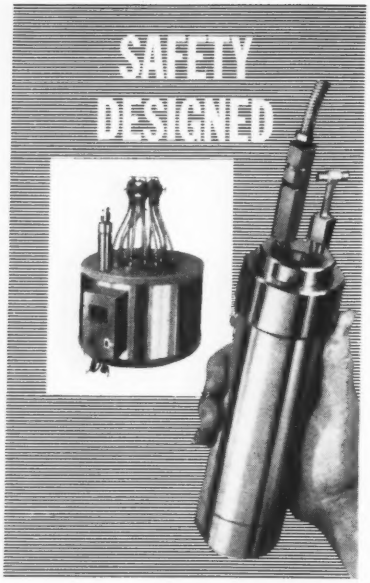
Ingredients may be paint-milled or simply stirred in. Casting and lamination or direct coating can be done with conventional equipment. Fusion, lamination and expansion are accomplished simultaneously at 380-400° F.

The foregoing recipes and conditions are shown merely to illustrate the relative ease with which CELOGEN-AZ can be used to impart the advantages of cellular structure to coated fabrics and other vinyl laminates. Many variations and adaptations are possible.

For more detailed information or discussion of a particular problem, call upon your Naugatuck Technical Representative.

**Naugatuck Chemical**

**Division of United States Rubber Company**




## SCOTT MODEL LGP PRESSURE AGING OVEN

*Featuring 14 small-volume*, seamless pressure cylinders encased in a solid aluminum block . . . the Scott Model LGP sets a new standard of *safety* and *cleanliness* for pressure aging tests of rubber, silicone and other elastomers.

*The Model LGP* uses no liquid heating medium — no danger of oil fires or explosions, no need for costly protective barricades. Each pressure cylinder has precise-seating cap, separate purging valve, and *blowout disc* for fast, safe release of excess pressure.

*No Contamination* — Individual pressure stop cocks permit examination and removal of test specimen without disturbing conditions in other pressure cylinders. Positively no migration or contamination from one pressure cylinder to another! All stainless steel construction (except blowout discs) eliminates metal contamination of test material.

*Easy Operation* — Slight hand pressure opens or closes pressure cylinder cap. Thermo-control switch and suitable insulation assure exact, uniform temperatures. Also, has over-riding thermo-switch for double protection. Scott automatic temperature recorders are also available to guarantee conformance with ASTM Methods of Test D-572 and D-454.

Write for complete facts on Scott safety-designed Model LGP. Scott Testers, Inc., 90 Blackstone Street, Providence, Rhode Island. Tel: DExter 1-5650 (Area Code 401).

**SCOTT TESTERS**

THE SURE TEST . . . SCOTT!


# news from abroad

Firestone Tire & Rubber Co., is a leading German manufacturer of tires, footwear and mechanical rubber goods, and employs 9,000 persons. The I.C.S. group has plants at Pont-de-Cheruy, Lyon, and Paris, and produces rubber footwear, hose and mechanical rubber goods, as well as reclaim.

**A new xylene resin, understood to be based on metaxylene formaldehyde resin and condensates of xylene resin,** has been produced by Matsushita Electric Works, Ltd., in collaboration with the Imoto Laboratory of the Osaka Municipal University, Japan. While the chief use for the new resin appears to be in laminates for communication equipment and in electronics, its compatibility with various organic compounds and synthetic resins suggests its application also in rubber adhesives. It is claimed that the dispersion of modified xylene resin with SBR, butyl and nitrile rubber is very good and largely increases tackiness.

**BRIDGESTONE TIRE CO., LTD., Tokyo, Japan,** is now in a position to start large-scale production of polyurethane foam, which it has been making in technical collaboration with the Bayer company of West Germany. The foam will be marketed under the name BS-Pren and at a price expected to be 10-20% lower than that of conventional foam rubbers.

**At the thirty-eighth Milan (Italy) Fair held in April, 1960, Montecatini showed its synthetic rubbers:** Dutral, copolymer of ethylene and propylene; Elaprim, an NBR and Unafor, 1-4 *cis* polybutadiene. Various applications of Dutral were on view including a big electric cable, vari-colored mats for automobiles and motor-scooters, and belts. The unusual resistance of Dutral products to ozone and ultra-violet light was demonstrated by a comparison with articles of natural rubber, SBR, and butyl rubber similarly exposed. Among the articles made of 1,4-*cis* polybutadiene (produced by Montecatini's own patented method) were featured tires for trucks, Fiat cars and motor-scooters, produced by Pirelli and Fratelli Gallorini. The treads of the Pirelli tires were composed of a mixture of 50 parts natural rubber and 50 parts of 1,4-*cis* polybutadiene; while those of Fratelli Gallorini were of all 1,4-*cis* polybutadiene.

**ESSO PETROLEUM plans a butyl rubber plant with annual capacity of 30,000 tons,** to be set up near the Fawley refinery. Britain's first butyl rubber plant, it is expected to cost more than $12,000,000 and to require two to three years to build. Present annual consumption of butyl rubber by Britain is estimated at 7,500 tons, all of which is imported from Canada and the United States.

**A merger of the Belgian firm Seneffe Rubber Co. with the Manufacture General du Caouthchouc et de Matières Plastiques Usines Gheysen S.A.,** Lembecq-Hal, Belgium, was decided on at an extraordinary general meeting held on May 9, 1960. The new company, which will be under the general management of C. and E. Gheysen, will be known as International Rubber S.A., Usines Gheysen et Seneffe Rubber Co., or for short: Interubber. The capital has been increased from 12,000,000 to 30,000,000 Belgian francs by participation of various companies including the German concerns, Metzeler Gummiwerke, Gummiwerk Odenwald, and Correcta Werke, and the Belgian firm of Trefileries L. Bekaert.

**B. F. GOODRICH CANADA, LTD., will add to its tire production facilities at Kitchener,** Ont. The new plant, expected to be a one-story, modern production unit, will be built on a new site on the southeast outskirts of the city. The City Council has agreed to furnish necessary services and land grading and has approved the sale of the city owned land.

**William M. Gaston,** with The B. F. Goodrich Co., Akron, O., since 1926, has been named managing director of B. F. Goodrich do Brazil, S.A., a subsidiary with headquarters in Sao Paulo, Brazil.

■

## Statement of RUBBER WORLD

Statement required by the Act of August 24, 1912, as amended by the Acts of March 3, 1933, July 2, 1946, and June 11, 1960 (74 Stat. 208) showing the ownership, management, and circulation of RUBBER WORLD, published monthly at Philadelphia, Pa., for October, 1960.

1. The names and addresses of the publisher, editor, managing editor, and business manager are: publisher, B. Brittain Wilson, 630 Third Ave., New York 17, N. Y.; editor, Robert G. Seaman, 630 Third Ave., New York 17, N. Y.; managing editor, S. R. Hague, 630 Third Ave., New York 17, N. Y.; business manager, Robert L. Miller, 630 Third Avenue, New York 17, N. Y.

2. The owner is: Bill Brothers Publishing Corp., Estate of Raymond Bill, Estate of Edward Lyman Bill, all at 630 Third Ave., New York 17, N. Y.

3. The known bondholders, mortgagees, and other security holders owning or holding 1% or more of total amount of bonds, mortgages, or other securities are: None.

4. Paragraphs 2 and 3 include, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting; also the statements in the two paragraphs show the affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner.

5. The average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the 12 months preceding the date shown above was: 3526.

B. BRITTAIN WILSON
*Publisher*

Sworn to and subscribed before me this 13th day of September, 1960.

[Seal] HELEN M. VERLIN

Notary Public in the State of New York. No. 31-9460500. Qualified in New York County.
(Commission expires March 30, 1962)

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ANTIDUST is completely water soluble—no residue, no scum—it contains nothing but active and efficient ingredients.

New Products with Imagination

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**NATIONAL POLYCHEMICALS, INC.**

*Wilmington, Massachusetts*

# statistics of the rubber industry

## U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

| Year | Natural | SBR | Neoprene | N-Type | Total Synthetic | Total Natural & Synthetic |
|---|---|---|---|---|---|---|
| 1959 | 79,207 | 93,303 | 13,127 | 14,034 | 120,464 | 199,671 |
| Oct. | 6,747 | 9,424 | 1,020 | 1,187 | 11,631 | 18,378 |
| Nov. | 5,055 | 8,144 | 1,206 | 1,104 | 10,454 | 15,509 |
| Dec. | 6,705 | 8,429 | 1,017 | 1,045 | 10,491 | 17,196 |
| 1960 | | | | | | |
| Jan. | 5,339 | 9,720 | 1,154 | 1,131 | 12,005 | 17,344 |
| Feb. | 5,812 | 9,862 | 1,085 | 1,098 | 12,045 | 17,857 |
| Mar. | 5,127 | 9,351 | 1,004 | 1,217 | 11,572 | 16,699 |
| Apr. | 4,935 | 9,408 | 1,137 | 917 | 11,462 | 16,397 |
| May | 5,380 | 8,162 | 1,250 | 1,009 | 10,421 | 15,801 |
| June | 3,335 | 7,541 | 965 | 973 | 9,479 | 12,814 |
| July* | .... | 6,481 | 953 | 983 | 8,417 | ..... |

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

## U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

| Year | Natural | SBR | Neoprene | N-Type | Total Synthetic | Total Natural & Synthetic |
|---|---|---|---|---|---|---|
| 1959 | 12,377 | 8,226 | 1,581 | 2,883 | 12,690 | 25,607 |
| Oct. | 12,220 | 7,570 | 1,464 | 2,888 | 11,922 | 24,142 |
| Nov. | 11,707 | 8,279 | 1,451 | 2,975 | 12,705 | 24,412 |
| Dec. | 12,377 | 8,226 | 1,581 | 2,883 | 12,690 | 25,067 |
| 1960 | | | | | | |
| Jan. | 12,781 | 7,781 | 1,680 | 2,799 | 12,260 | 25,041 |
| Feb. | 12,974 | 8,606 | 1,534 | 2,535 | 12,675 | 25,649 |
| Mar. | 13,964 | 8,055 | 1,518 | 2,492 | 12,065 | 26,029 |
| Apr. | 13,896 | 9,081 | 1,595 | 2,242 | 12,918 | 26,814 |
| May | 15,214 | 10,031 | 1,745 | 3,342 | 14,118 | 29,332 |
| June | 14,140 | 9,142 | 1,530 | 1,941 | 12,613 | 26,753 |
| July* | 14,785 | 9,364 | 1,564 | 2,064 | 12,992 | 27,777 |

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

## U.S.A. Exports of Synthetic Rubber

(Long Tons)

| Year | SBR Types | Butyl | Neoprene | N-Type | Total |
|---|---|---|---|---|---|
| 1959 | 220,336 | 21,700 | 39,551 | 8,256 | 289,843 |
| July | 19,814 | 1,580 | 4,105 | 440 | 25,939 |
| Aug. | 18,054 | 1,896 | 2,557 | 1,025 | 23,532 |
| Sept. | 22,506 | 2,240 | 4,864 | 692 | 30,302 |
| Oct. | 13,476 | 1,383 | 2,250 | 679 | 17,788 |
| Nov. | 18,916 | 1,242 | 3,362 | 648 | 24,168 |
| Dec. | 25,392 | 1,265 | 4,662 | 1,031 | 32,350 |
| 1960 | | | | | |
| Jan. | 21,967 | 2,396 | 4,185 | 527 | 29,075 |
| Feb. | 22,791 | 1,528 | 4,588 | 740 | 29,647 |
| Mar. | 27,081 | 1,803 | 4,874 | 532 | 34,290 |
| Apr. | 28,765 | 2,006 | 5,268 | 676 | 36,715 |
| May | 23,337 | 1,936 | 4,213 | 1,320 | 30,806 |
| June | 23,130 | 2,062 | 3,699 | 464 | 29,355 |

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce

## U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

| Year | Natural | SBR Types | Butyl | Neoprene | N-Type | Total Natural and Synthetic |
|---|---|---|---|---|---|---|
| 1959 | 555,044 | 886,275 | 65,454 | 84,955 | 34,638 | 1,626,366 |
| Oct. | 49,049 | 81,963 | 5,965 | 7,538 | 3,128 | 147,643 |
| Nov. | 42,039 | 69,217 | 5,327 | 6,684 | 2,655 | 125,922 |
| Dec. | 42,950 | 73,871 | 5,489 | 6,996 | 2,696 | 132,002 |
| 1960 | | | | | | |
| Jan. | 46,354 | 78,891 | 6,093 | 7,361 | 2,788 | 141,487 |
| Feb. | 46,022 | 76,999 | 6,070 | 7,369 | 2,765 | 139,225 |
| Mar. | 47,205 | 81,065 | 6,324 | 7,693 | 2,645 | 144,932 |
| Apr. | 42,032 | 75,849 | 5,492 | 6,525 | 2,386 | 132,284 |
| May | 41,263 | 77,423 | 5,602 | 6,471 | 2,497 | 133,256 |
| June | 42,576 | 80,951 | 5,150 | 7,129 | 2,619 | 138,425 |
| July* | 35,229 | 67,853 | 4,597 | 4,936 | 2,027 | 114,642 |

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

## U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

| Year | New Supply | Consumption | Exports | Stocks |
|---|---|---|---|---|
| 1959 | 303,345 | 286,410 | 12,812 | 27,738 |
| Oct. | 28,255 | 26,022 | 964 | 27,393 |
| Nov. | 22,525 | 20,217 | 909 | 28,526 |
| Dec. | 23,720 | 22,962 | 1,055 | 27,738 |
| 1960 | | | | |
| Jan. | 26,442 | 26,540 | 1,106 | 29,031 |
| Feb. | 26,965 | 25,944 | 1,258 | 28,653 |
| Mar. | 29,100 | 26,625 | 1,542 | 29,719 |
| Apr. | 26,209 | 24,210 | 1,248 | 30,916 |
| May | 25,676 | 23,763 | 1,167 | 32,611 |
| June | 25,429 | 24,677 | 1,164 | 31,699 |
| July* | 21,472 | 19,249 | .... | 33,624 |

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce

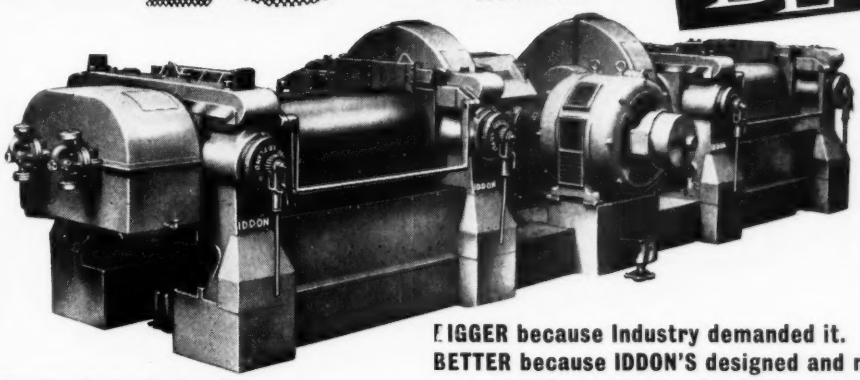
## U.S.A. Stocks of Synthetic Rubber

(Long Tons)

| Year | SBR Types | Butyl | Neoprene | N-Type | Total |
|---|---|---|---|---|---|
| 1959 | | | | | |
| July | 142,606 | 9,899 | 15,187 | 8,912 | 176,604 |
| Aug. | 148,795 | 10,558 | 15,745 | 8,418 | 183,516 |
| Sept. | 147,400 | 9,535 | 12,845 | 8,526 | 178,306 |
| Oct. | 157,768 | 10,805 | 13,385 | 8,649 | 190,607 |
| Nov. | 168,490 | 11,447 | 13,043 | 9,077 | 202,057 |
| Dec. | 174,606 | 13,188 | 14,164 | 8,888 | 210,846 |
| 1960 | | | | | |
| Jan. | 183,242 | 14,039 | 15,143 | 9,198 | 221,622 |
| Feb. | 186,166 | 12,735 | 13,930 | 8,352 | 221,183 |
| Mar. | 189,308 | 12,764 | 13,491 | 8,175 | 223,738 |
| Apr. | 185,464 | 14,021 | 13,796 | 8,230 | 221,511 |
| May | 188,808 | 16,014 | 14,243 | 8,267 | 227,332 |
| June | 183,996 | 18,912 | 15,411 | 7,498 | 226,032 |
| July* | 192,552 | 18,689 | 16,954 | 8,922 | 235,693 |

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

# BIGGER and BETTER



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## World Consumption of Natural Rubber

(1,000 Long Tons)

| Year | United States | Eastern Europe and China | United Kingdom | Other Foreign | Total Foreign | Grand* Total |
|---|---|---|---|---|---|---|
| 1959 | 555.0 | 445.2 | 180.6 | 924.2 | 1,550.0 | 2,105.0 |
| Mar. | 52.0 | 19.0 | 15.3 | 78.8 | 117.7 | 165.0 |
| Apr. | 41.5 | 37.8 | 13.9 | 80.2 | 131.0 | 172.5 |
| May | 38.8 | 41.2 | 13.8 | 76.2 | 131.2 | 170.0 |
| June | 47.8 | 42.1 | 18.3 | 82.4 | 134.7 | 182.5 |
| July | 47.5 | 32.7 | 13.0 | 74.3 | 112.0 | 172.5 |
| Aug. | 46.9 | 16.8 | 11.0 | 67.8 | 84.6 | 142.5 |
| Sept. | 49.3 | 41.1 | 18.1 | 81.5 | 122.6 | 190.0 |
| Oct. | 49.0 | 40.0 | 15.5 | 78.5 | 118.5 | 185.0 |
| Nov. | 42.0 | 49.4 | 15.6 | 78.0 | 127.4 | 185.0 |
| Dec. | 43.0 | 48.1 | 17.0 | 73.3 | 136.1 | 185.0 |
| 1960 | | | | | | |
| Jan. | 46.4 | 45.4 | 14.7 | 76.0 | 136.1 | 182.5 |
| Feb. | 46.0 | 31.9 | 14.3 | 80.3 | 126.5 | 172.5 |
| Mar. | 47.2 | 15.0 | 17.3 | 83.0 | 115.3 | 162.5 |
| Apr. | 42.0 | 26.8 | 13.5 | 77.7 | 118.0 | 160.0 |
| May | 41.3 | 25.0 | 14.3 | 79.4 | 118.7 | 160.0 |
| June | 42.6 | .. | 16.4 | ... | .... | .... |

*Estimated.
Source: Bureau of the Census, Industry Division, Chemicals Branch United States Department of Commerce; and Secretariat of the International Rubber Study Group.

## World Production of Natural Rubber

(1,000 Long Tons)

| | Malaya | | Indonesia | | | |
|---|---|---|---|---|---|---|
| Year | Estate | Native | Estate | Native | All Other | Total |
| 1959 | 408.4 | 289.8 | 215.6 | 505.8 | 645.4 | 2,065.0 |
| Mar. | 28.5 | 21.1 | 17.7 | 39.4 | 48.3 | 155.0 |
| Apr. | 28.9 | 19.4 | 15.3 | 44.7 | 46.7 | 155.0 |
| May | 33.5 | 22.4 | 16.3 | 50.6 | 49.7 | 172.5 |
| June | 33.9 | 24.3 | 18.4 | 49.5 | 39.9 | 165.0 |
| July | 35.7 | 26.9 | 18.7 | 35.5 | 63.2 | 180.0 |
| Aug. | 36.5 | 24.9 | 17.9 | 43.5 | 54.7 | 177.5 |
| Sept. | 35.7 | 26.1 | 17.0 | 38.8 | 52.4 | 170.0 |
| Oct. | 36.0 | 25.5 | 18.0 | 53.0 | 68.5 | 192.5 |
| Nov. | 35.7 | 24.1 | 18.0 | 44.5 | 62.7 | 185.0 |
| Dec. | 38.6 | 26.7 | 19.5 | 54.7 | 63.0 | 202.5 |
| 1960 | | | | | | |
| Jan. | 37.4 | 27.5 | 18.0 | 28.0 | 59.4 | 170.0 |
| Feb. | 32.1 | 22.6 | 17.4 | 32.9 | 45.2 | 150.0 |
| Mar. | 30.0 | 25.0 | 15.8 | 34.8 | 52.0 | 157.5 |
| Apr. | 28.1 | 18.8 | 14.7 | 40.4 | 53.0 | 155.0 |
| May | 33.0 | 23.8 | 16.7 | 32.3 | 51.7 | 157.5 |
| June | 34.2 | 24.0 | ... | ... | ... | ... |

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; Secretariat of the International Rubber Study Group.

## World Consumption of Synthetic Rubber*

(1,000 Long Tons)

| Year | U.S.A. | Canada | United Kingdom | Total† Continent of Europe | World† Grand Total |
|---|---|---|---|---|---|
| 1959 | 1,071.3 | 57.2 | 79.0 | 231.0 | 1,567.5 |
| Mar. | 95.1 | 5.0 | 7.0 | 17.5 | 132.5 |
| Apr. | 79.7 | 5.1 | 6.2 | 18.3 | 120.0 |
| May | 74.6 | 4.8 | 6.0 | 18.3 | 112.5 |
| June | 91.7 | 5.5 | 8.1 | 18.5 | 135.0 |
| July | 93.7 | 4.5 | 5.4 | 19.0 | 135.0 |
| Aug. | 91.0 | 3.4 | 4.3 | 15.5 | 127.5 |
| Sept. | 96.9 | 5.0 | 8.3 | 20.0 | 142.5 |
| Oct. | 98.6 | 4.8 | 6.6 | 20.8 | 145.0 |
| Nov. | 83.9 | 4.9 | 7.2 | 22.3 | 132.5 |
| Dec. | 89.1 | 4.7 | 8.7 | 21.7 | 137.5 |
| 1960 | | | | | |
| Jan. | 95.1 | 4.8 | 8.4 | 23.0 | 142.5 |
| Feb. | 93.2 | 5.2 | 8.5 | 24.8 | 145.0 |
| Mar. | 97.7 | 5.4 | 10.5 | 26.3 | 152.5 |
| Apr. | 90.2 | 4.4 | 8.4 | 26.0 | 145.0 |
| May | 92.0 | 4.1 | 9.0 | 27.5 | 147.5 |
| June | 95.0 | .. | 10.0 | ... | .... |

*Includes latices.
†Figures estimated or partly estimated.
Sources: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

## World Production of Synthetic Rubber

(1,000 Long Tons)

| Year | U.S.A. | Canada | Germany | Total |
|---|---|---|---|---|
| 1959 | 1,379.7 | 100.7 | 48.1 | 1,528.5 |
| Mar. | 111.4 | 7.5 | 3.7 | 122.6 |
| Apr. | 108.5 | 0.0 | 3.5 | 111.9 |
| May | 110.0 | 0.3 | 3.0 | 113.3 |
| June | 106.7 | 0.4 | 4.7 | 111.5 |
| July | 114.3 | 9.2 | 3.2 | 126.7 |
| Aug. | 119.0 | 11.1 | 4.7 | 134.8 |
| Sept. | 119.8 | 11.4 | 4.6 | 135.9 |
| Oct. | 128.5 | 11.5 | 5.1 | 145.1 |
| Nov. | 124.8 | 11.9 | 5.4 | 142.1 |
| Dec. | 125.8 | 13.0 | 5.9 | 144.7 |
| 1960 | | | | |
| Jan. | 130.7 | 12.6 | 5.9 | 125.4 |
| Feb. | 126.3 | 13.0 | 5.8 | 160.0 |
| Mar. | 131.9 | 14.2 | 7.3 | 165.0 |
| Apr. | 120.9 | 13.2 | 7.0 | 157.5 |
| May | 126.8 | 13.5 | 5.6 | 162.5 |
| June | 122.5 | ... | 5.3 | .... |

Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

## U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

| Year | Natural | SBR Types | Butyl | Neoprene | N-Type | Total Natural and Synthetic |
|---|---|---|---|---|---|---|
| 1959 | 580,197 | 1,130,660 | 81,008 | 124,815 | 43,169 | 1,959,849 |
| Mar. | 48,584 | 91,847 | 6,056 | 9,690 | 3,784 | 159,961 |
| Apr. | 44,347 | 88,444 | 6,279 | 10,455 | 3,299 | 152,824 |
| May | 45,451 | 89,625 | 6,467 | 10,249 | 3,610 | 155,402 |
| June | 46,048 | 87,221 | 5,583 | 10,216 | 3,696 | 153,124 |
| July | 47,527 | 94,749 | 6,391 | 9,365 | 3,811 | 161,843 |
| Aug. | 45,359 | 97,113 | 8,050 | 10,471 | 3,397 | 164,930 |
| Sept. | 47,643 | 97,677 | 7,399 | 10,888 | 3,883 | 167,490 |
| Oct. | 48,378 | 106,643 | 7,957 | 10,099 | 3,833 | 176,910 |
| Nov. | 48,844 | 101,856 | 7,523 | 11,660 | 3,786 | 173,669 |
| Dec. | 54,149 | 102,157 | 8,661 | 11,475 | 3,486 | 179,928 |
| 1960 | | | | | | |
| Jan. | 34,795 | 106,853 | 8,171 | 11,958 | 3,760 | 170,876 |
| Feb. | 40,949 | 104,603 | 6,514 | 12,106 | 3,111 | 173,095 |
| Mar. | 38,580 | 109,440 | 7,605 | 11,305 | 3,583 | 170,513 |
| Apr. | 36,343 | 97,963 | 7,958 | 11,879 | 3,095 | 157,238 |
| May | 36,028 | 102,501 | 9,814 | 11,401 | 3,088 | 162,832 |
| June | 38,647 | 98,635 | 9,475 | 11,614 | 2,823 | 161,194 |
| July* | .... | 95,584 | 8,389 | 10,210 | 2,401 | ..... |

*Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

## U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

| Year | Natural | SBR | Neoprene | N-Type | Total Synthetic | Total Natural & Synthetic |
|---|---|---|---|---|---|---|
| 1959 | 71,745 | 80,646 | 11,394 | 13,258 | 105,298 | 177,043 |
| Mar. | 7,052 | 7,275 | 1,054 | 1,208 | 9,537 | 16,589 |
| Apr. | 5,793 | 5,629 | 1,104 | 1,169 | 7,902 | 13,695 |
| May | 5,429 | 5,962 | 995 | 1,112 | 8,069 | 14,966 |
| June | 5,622 | 6,497 | 910 | 1,150 | 8,557 | 14,179 |
| July | 5,004 | 5,804 | 919 | 940 | 7,663 | 12,667 |
| Aug. | 6,613 | 7,348 | 961 | 1,116 | 9,425 | 16,038 |
| Sept. | 6,342 | 6,919 | 910 | 1,178 | 9,007 | 15,349 |
| Oct. | 6,153 | 7,388 | 969 | 1,158 | 9,515 | 15,668 |
| Nov. | 4,858 | 6,427 | 893 | 981 | 8,301 | 13,159 |
| Dec. | 5,206 | 7,428 | 895 | 993 | 9,316 | 14,522 |
| 1960 | | | | | | |
| Jan. | 5,493 | 8,094 | 999 | 1,117 | 10,210 | 15,701 |
| Feb. | 5,463 | 7,838 | 969 | 1,000 | 9,807 | 15,270 |
| Mar. | 4,847 | 8,104 | 1,076 | 927 | 10,107 | 14,954 |
| Apr. | 4,199 | 7,154 | 913 | 976 | 9,043 | 13,142 |
| May | 3,655 | 6,821 | 868 | 978 | 8,667 | 11,322 |
| June | 3,975 | 7,147 | 1,033 | 981 | 9,161 | 13,136 |
| July* | 2,912 | 5,433 | 729 | 780 | 6,942 | 10,854 |

* Preliminary.
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

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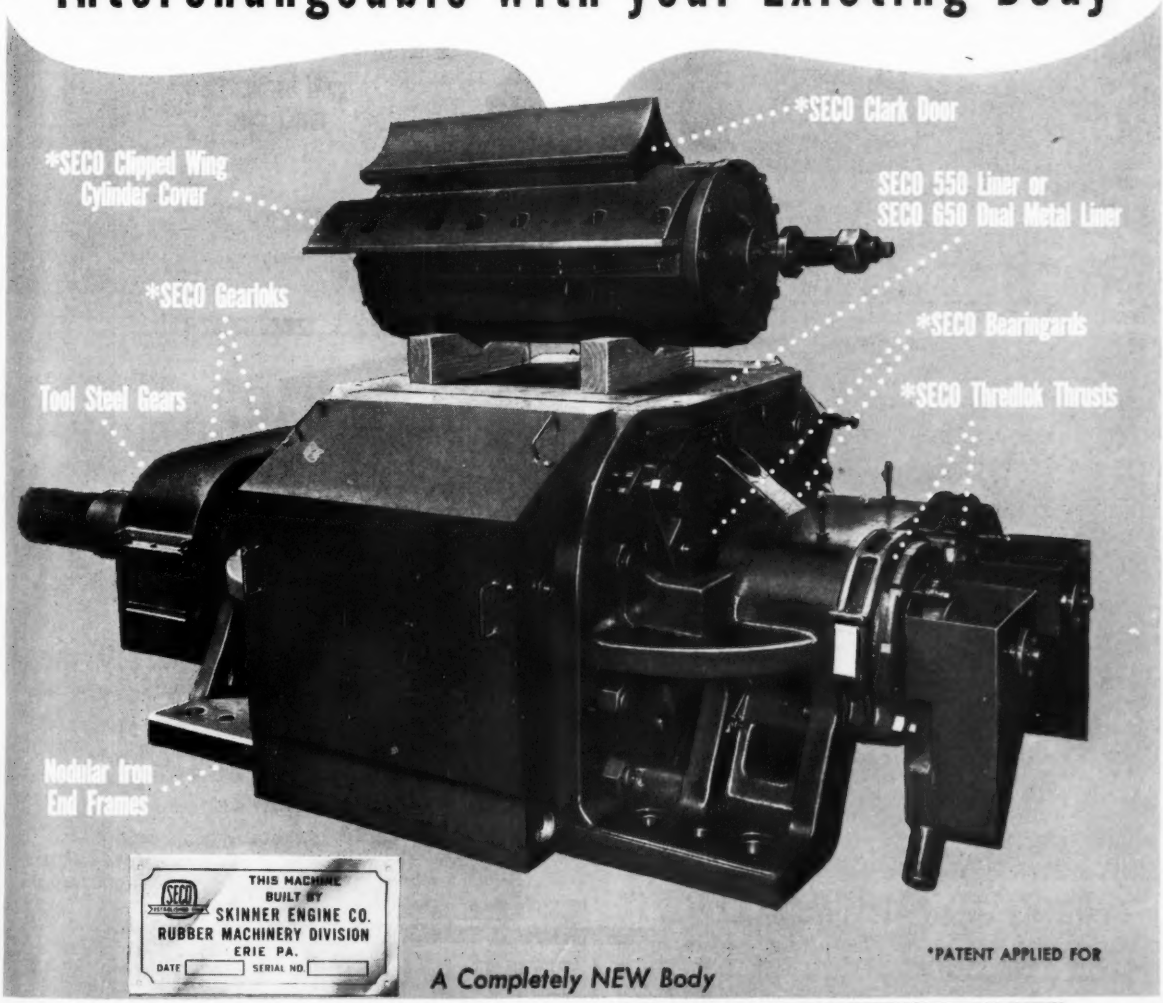


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RUBBER MACHINERY DIVISION
TELEPHONE GLENDALE 2-3661
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# Carbon Black Statistics—January-July, 1960

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; GPF, general-purpose furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, super abrasion furnace black; ISAF, intermediate super abrasion furnace black.

(Thousands of Pounds)

| | Jan. | Feb. | Mar. | Apr. | May | June | July |
|---|---|---|---|---|---|---|---|
| *Production* | | | | | | | |
| Furnace types | | | | | | | |
| Thermal | 14,746 | 12,438 | 14,690 | 13,481 | 13,337 | 12,004 | 11,481 |
| SRF | 27,138 | 25,673 | 28,063 | 30,176 | 30,380 | 27,179 | 28,879 |
| HMF | 6,645 | 5,919 | 5,777 | 6,883 | 7,361 | 6,889 | 5,492 |
| GPF | 9,462 | 9,722 | 9,833 | 10,420 | 10,711 | 10,792 | 11,315 |
| FEF | 21,450 | 22,599 | 23,423 | 20,449 | 22,938 | 20,825 | 20,449 |
| HAF | 49,793 | 43,816 | 44,466 | 43,049 | 52,592 | 44,695 | 44,694 |
| SAF | — | 1,549 | 1,778 | 2,837 | 357 | 2,051 | 905 |
| ISAF | 24,744 | 25,283 | 30,116 | 29,720 | 26,299 | 25,610 | 25,413 |
| Total furnace | 153,978 | 146,999 | 158,146 | 157,015 | 163,975 | 150,045 | 148,628 |
| Contact types | 25,590 | 23,503 | 25,099 | 25,155 | 25,105 | 23,643 | 23,928 |
| Totals | 179,568 | 170,502 | 183,245 | 182,170 | 189,080 | 173,688 | 172,556 |
| *Shipments* | | | | | | | |
| Furnace types | | | | | | | |
| Thermal | 19,372 | 9,159 | 14,100 | 12,130 | 12,531 | 11,475 | 9,805 |
| SRF | 25,327 | 25,680 | 29,378 | 28,175 | 25,877 | 23,960 | 24,441 |
| HMF | 5,533 | 6,780 | 6,759 | 6,977 | 5,727 | 5,265 | 4,867 |
| GPF | 8,194 | 9,034 | 9,556 | 11,547 | 11,056 | 10,320 | 9,502 |
| FEF | 20,845 | 20,824 | 22,421 | 19,258 | 17,416 | 20,403 | 17,128 |
| HAF | 45,492 | 42,592 | 44,037 | 45,443 | 39,810 | 43,740 | 35,338 |
| SAF | 826 | 993 | 1,483 | 1,559 | 1,861 | 1,505 | 1,801 |
| ISAF | 23,034 | 27,284 | 28,253 | 26,101 | 26,026 | 27,838 | 26,643 |
| Total furnace | 148,623 | 142,346 | 155,987 | 151,190 | 140,304 | 144,506 | 129,525 |
| Contact types | 40,807 | 15,474 | 23,666 | 26,247 | 22,493 | 20,806 | 20,258 |
| Totals | 189,430 | 157,820 | 179,653 | 177,837 | 162,797 | 165,312 | 149,783 |
| *Producers' Stocks, End of Period* | | | | | | | |
| Furnace types | | | | | | | |
| Thermal | 16,097 | 19,376 | 19,966 | 21,317 | 22,123 | 22,652 | 24,328 |
| SRF | 24,506 | 24,543 | 23,228 | 25,229 | 29,732 | 32,951 | 37,389 |
| HMF | 4,894 | 4,033 | 3,051 | 2,957 | 4,591 | 6,215 | 6,840 |
| GPF | 6,253 | 6,941 | 7,218 | 6,091 | 5,746 | 6,218 | 8,031 |
| FEF | 10,957 | 12,732 | 13,734 | 14,925 | 20,447 | 20,869 | 24,190 |
| HAF | 35,630 | 36,854 | 37,283 | 35,092 | 47,874 | 48,829 | 58,185 |
| SAF | 3,254 | 3,810 | 4,105 | 5,383 | 3,879 | 4,425 | 3,529 |
| ISAF | 30,364 | 28,363 | 30,226 | 33,845 | 34,118 | 31,890 | 30,660 |
| Total furnace | 131,955 | 136,652 | 138,811 | 144,839 | 168,510 | 174,049 | 193,152 |
| Contact types | 52,025 | 60,054 | 61,487 | 59,995 | 62,607 | 65,444 | 69,114 |
| Totals | 183,980 | 196,706 | 200,298 | 204,834 | 231,117 | 239,493 | 262,266 |
| *Exports* | | | | | | | |
| Furnace types | | | | | | | |
| Total furnace | 37,598 | 26,574 | 35,408 | 41,367 | 30,769 | 30,319 | ..... |
| Contact types | 23,310 | 10,635 | 8,920 | 13,862 | 8,774 | 10,526 | ..... |
| Totals | 60,908 | 37,209 | 44,328 | 55,229 | 39,543 | 40,845 | ..... |

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

# U.S.A. Rubber Industry Sales and Inventories

(Millions of Dollars)

| | Value of Sales* | | | | Manufacturers' Inventories* | | | |
|---|---|---|---|---|---|---|---|---|
| | 1957 | 1958 | 1959 | 1960 | 1957 | 1958 | 1959 | 1960 |
| Jan. | 496 | 448 | 508 | 530 | 1,047 | 1,100 | 1,013 | 1,148 |
| Feb. | 495 | 413 | 490 | 540 | 1,036 | 1,087 | 1,032 | 1,140 |
| Mar. | 476 | 412 | 506 | 510 | 1,030 | 1,112 | 1,030 | 1,160 |
| Apr. | 490 | 429 | 543 | 530 | 1,031 | 1,047 | 1,015 | 1,190 |
| May | 481 | 428 | 524 | 550 | 1,024 | 1,020 | 995 | 1,180 |
| June | 458 | 445 | 520 | 520 | 1,027 | 986 | 1,013 | 1,200 |
| July | 514 | 478 | 519 | 480 | 1,045 | 980 | 1,075 | 1,230 |
| Aug. | 481 | 438 | 492 | ... | 1,074 | 1,024 | 1,113 | ... |
| Sept. | 481 | 464 | 544 | ... | 1,074 | 1,024 | 1,114 | ... |
| Oct. | 490 | 493 | 555 | ... | 1,097 | 1,022 | 1,115 | ... |
| Nov. | 431 | 472 | 482 | ... | 1,101 | 1,018 | 1,120 | ... |
| Dec. | 427 | 518 | 508 | ... | 1,092 | 994 | 1,124 | ... |
| Total | 5,720 | 5,438 | 6,191 | ... | 12,678 | 12,414 | 12,759 | ... |

* Adjusted for seasonal variation.

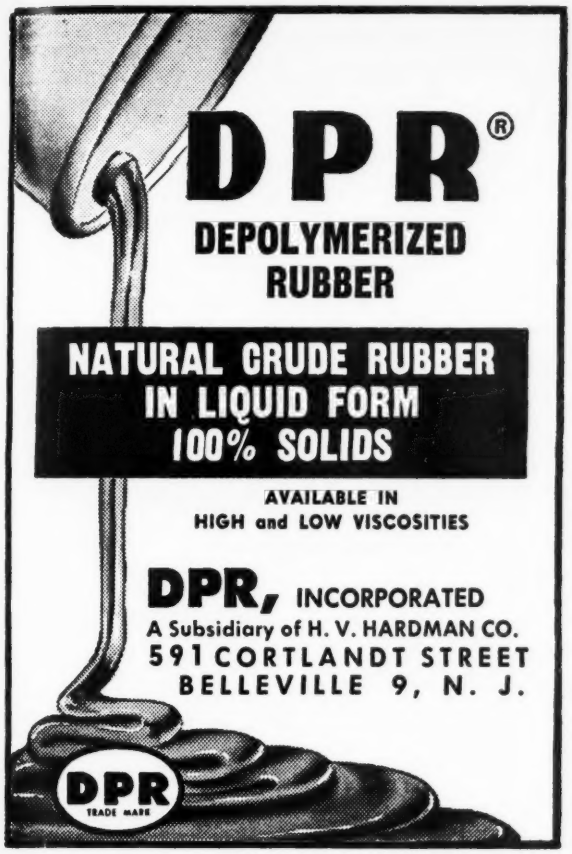
Source: Office of Business Economics, United States Department of Commerce.

# U.S.A. Rubber Use by Products

(1,000 Long Tons)

| | Transportation | | | Non-Transportation | | | |
|---|---|---|---|---|---|---|---|
| Year | Natural | Synthetic | Total | Natural | Synthetic | Total | Grand Total |
| 1955 | 409.6 | 550.3 | 959.9 | 225.2 | 344.7 | 569.8 | 1,529.7 |
| 1956 | 364.0 | 533.0 | 897.0 | 198.1 | 341.3 | 539.5 | 1,436.5 |
| 1957 | 342.7 | 583.5 | 926.2 | 196.0 | 342.4 | 538.5 | 1,464.6 |
| 1958 | 302.0 | 558.9 | 860.9 | 182.4 | 321.0 | 503.5 | 1,364.4 |
| 1959 | 354.7 | 669.6 | 1,024.3 | 200.4 | 401.7 | 602.1 | 1,627.7 |
| 1959 | | | | | | | |
| 1st qt. | 95.1 | 172.3 | 267.4 | 54.1 | 99.8 | 153.9 | 421.7 |
| 2nd qt. | 78.9 | 148.5 | 226.3 | 49.1 | 98.6 | 147.8 | 374.4 |
| 3rd qt. | 94.0 | 182.7 | 276.7 | 49.7 | 98.8 | 148.6 | 425.8 |
| 4th qt. | 86.7 | 167.2 | 253.8 | 47.4 | 104.4 | 151.7 | 406.0 |
| 1960 | | | | | | | |
| 1st qt. | 94.8 | 176.1 | 270.9 | 44.8 | 110.0 | 154.7 | 425.7 |
| 2nd qt. | 87.2 | 176.7 | 263.9 | 38.7 | 101.4 | 140.0 | 404.0 |

Source: Secretariat of the International Rubber Study Group.

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# U.S.A. Rubber Industry Employment, Wages, Hours

| Year | Production Workers (1000's) | Average Weekly Earnings | Average Weekly Hours | Average Hourly Earnings | Consumer's Price Index |
|---|---|---|---|---|---|
| | | All Rubber Products | | | |
| 1939 | 121.0 | $27.84 | 39.9 | $0.75 | |
| 1959 | | | | | |
| Jan. | 199.1 | 100 28 | 41.1 | 2.44 | 123.8 |
| Feb. | 198.8 | 101.09 | 41.6 | 2.43 | 123.7 |
| Mar. | 201.5 | 103.74 | 42.0 | 2.47 | 123.7 |
| Apr. | 237.0 | 101.57 | 41.8 | 2.43 | 123.9 |
| May | 231.9 | 101.46 | 42.1 | 2.41 | 124.0 |
| June | 255.8 | 98.74 | 40.3 | 2.45 | 124.5 |
| July | 264.0 | 107.10 | 42.5 | 2.52 | 124.9 |
| Aug. | 264.7 | 105.33 | 42.3 | 2.49 | 124.8 |
| Sept. | 273.5 | 102.01 | 41.3 | 2.47 | 125.2 |
| Oct. | 273.2 | 101.18 | 40.8 | 2.48 | 125.5 |
| Nov. | 270.1 | 97.66 | 39.7 | 2.46 | 125.6 |
| Dec. | 269.5 | 101.59 | 40.8 | 2.49 | 125.5 |
| 1960 | | | | | |
| Jan. | 269.2 | 102.16 | 40.7 | 2.51 | 125.4 |
| Feb. | 269.0 | 100.00 | 40.0 | 2.50 | 126.5 |
| Mar. | 267.5 | 97.10 | 39.4 | 2.48 | 125.7 |
| Apr. | 260.2 | 94.60 | 38.3 | 2.47 | 126.2 |
| May | 257.7 | 100.80 | 40.0 | 2.52 | 126.3 |
| June | 258.8 | ..... | ... | ... | 126.5 |
| | | Tires and Tubes | | | |
| 1939 | 54.2 | $33.36 | 35.0 | $0.96 | |
| 1959 | | | | | |
| Jan. | 76.9 | 117.55 | 41.1 | 2.86 | |
| Feb. | 76.2 | 118.98 | 41.6 | 2.86 | |
| Mar. | 77.9 | 122.96 | 42.4 | 2.90 | |
| Apr. | 93.1 | 123.98 | 42.9 | 2.89 | |
| May | 79.5 | 126.13 | 42.9 | 2.94 | |
| June | 97.0 | 108.93 | 36.8 | 2.96 | |
| July | 106.7 | 128.74 | 43.2 | 2.98 | |
| Aug. | 105.4 | 127.74 | 43.3 | 2.95 | |
| Sept. | 108.0 | 117.56 | 40.4 | 2.91 | |
| Oct. | 107.0 | 117.49 | 40.1 | 2.93 | |
| Nov. | 106.1 | 112.62 | 38.7 | 2.91 | |
| Dec. | 105.5 | 118.59 | 40.2 | 2.95 | |
| 1960 | | | | | |
| Jan. | 105.3 | 119.80 | 40.5 | 2.98 | |
| Feb. | 104.0 | 117.71 | 39.5 | 2.98 | |
| Mar. | 105.1 | 113.68 | 38.8 | 2.93 | |
| Apr. | 104.4 | 107.38 | 36.9 | 2.91 | |
| May | 103.7 | 118.40 | 40.0 | 2.96 | |
| | | Rubber Footwear | | | |
| 1939 | 14.8 | $22.80 | 37.5 | $0.61 | |
| 1959 | | | | | |
| Jan. | 17.1 | 78.20 | 39.9 | 1.96 | |
| Feb. | 17.1 | 80.59 | 40.7 | 1.98 | |
| Mar. | 17.4 | 79.79 | 40.3 | 1.98 | |
| Apr. | 17.2 | 73.05 | 39.7 | 1.84 | |
| May | 21.8 | 79.58 | 40.6 | 1.96 | |
| June | 22.3 | 81.58 | 41.2 | 1.98 | |
| July | 22.5 | 78.60 | 40.1 | 1.96 | |
| Aug. | 22.7 | 79.17 | 40.6 | 1.95 | |
| Sept. | 23.2 | 79.18 | 40.4 | 1.96 | |
| Oct. | 23.3 | 79.40 | 39.9 | 1.99 | |
| Nov. | 23.7 | 79.80 | 39.9 | 2.00 | |
| Dec. | 23.6 | 80.79 | 39.8 | 2.03 | |
| 1960 | | | | | |
| Jan. | 23.1 | 79.40 | 39.5 | 2.01 | |
| Feb. | 23.0 | 77.21 | 38.8 | 1.99 | |
| Mar. | 22.8 | 78.61 | 39.5 | 1.99 | |
| Apr. | 18.5 | 77.01 | 38.7 | 1.99 | |
| May | 18.1 | 81.40 | 40.1 | 2.03 | |
| | | Other Rubber Products | | | |
| 1939 | 51.9 | $23.34 | 38.9 | $0.61 | |
| 1959 | | | | | |
| Jan. | 105.1 | 91.27 | 41.3 | 2.21 | |
| Feb. | 105.5 | 91.96 | 41.8 | 2.20 | |
| Mar. | 106.2 | 93.02 | 41.9 | 2.22 | |
| Apr. | 126.7 | 90.03 | 41.3 | 2.18 | |
| May | 130.6 | 92.18 | 41.9 | 2.20 | |
| June | 136.5 | 94.98 | 42.4 | 2.24 | |
| July | 134.8 | 95.40 | 42.4 | 2.25 | |
| Aug. | 136.6 | 93.21 | 41.8 | 2.23 | |
| Sept. | 142.3 | 94.73 | 42.1 | 2.25 | |
| Oct. | 142.9 | 93.38 | 41.5 | 2.25 | |
| Nov. | 140.3 | 89.87 | 40.3 | 2.23 | |
| Dec. | 140.4 | 92.93 | 41.3 | 2.25 | |
| 1960 | | | | | |
| Jan. | 140.8 | 93.52 | 41.2 | 2.27 | |
| Feb. | 142.0 | 91.76 | 40.6 | 2.26 | |
| Mar. | 139.5 | 89.78 | 39.9 | 2.25 | |
| Apr. | 133.3 | 88.43 | 39.3 | 2.25 | |
| May | 132.1 | 90.57 | 39.9 | 2.27 | |

Source: BLS, United States Department of Labor.

# U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

| Year | Shipments: Original Equipment | Shipments: Replacement | Shipments: Export | Shipments: Total | Production | Inventory End of Period |
|---|---|---|---|---|---|---|
| Passenger Car | | | | | | |
| 1959 | | | | | | |
| June .. | 2,904 | 5,936 | 46.3 | 8,886 | 9,022 | 16,134 |
| July .. | 3,188 | 5,988 | 65.4 | 9,242 | 9,857 | 16,853 |
| Aug. .. | 973 | 5,721 | 67.3 | 6,761 | 8,458 | 18,677 |
| Sept. .. | 1,923 | 5,850 | 77.4 | 7,850 | 8,804 | 19,636 |
| Oct. .. | 2,628 | 6,015 | 78.9 | 8,722 | 9,374 | 20,287 |
| Nov. .. | 1,252 | 4,161 | 63.5 | 5,476 | 7,088 | 21,996 |
| Dec. .. | 2,916 | 3,829 | 105.8 | 6,849 | 8,349 | 23,599 |
| 1960 | | | | | | |
| Jan. .. | 3,912 | 6,006 | 111 | 10,030 | 9,011 | 22,567 |
| Feb. .. | 3,569 | 5,257 | 78 | 8,804 | 9,371 | 22,972 |
| Mar. .. | 3,333 | 5,156 | 90 | 8,578 | 9,679 | 24,144 |
| Apr. .. | 3,200 | 6,558 | 114 | 9,872 | 9,165 | 23,512 |
| May .. | 3,361 | 6,542 | 78 | 9,981 | 9,548 | 22,985 |
| June .. | 3,098 | 7,099 | 94 | 10,290 | 9,544 | 22,271 |
| July .. | 2,456 | 6,377 | 82 | 8,915 | 8,680 | 22,097 |
| Truck and Bus | | | | | | |
| 1959 | | | | | | |
| June .. | 488 | 820 | 44 | 1,352 | 1,272 | 2,954 |
| July .. | 400 | 844 | 47 | 1,290 | 1,366 | 3,023 |
| Aug. .. | 276 | 874 | 46 | 1,196 | 1,225 | 3,054 |
| Sept. .. | 422 | 969 | 58 | 1,448 | 1,299 | 2,906 |
| Oct. .. | 338 | 1,151 | 57 | 1,546 | 1,510 | 2,864 |
| Nov. .. | 189 | 737 | 56 | 981 | 1,259 | 3,137 |
| Dec. .. | 285 | 739 | 75 | 1,099 | 1,301 | 3,355 |
| 1960 | | | | | | |
| Jan. .. | 421 | 826 | 45 | 1,292 | 1,315 | 3,376 |
| Feb. .. | 428 | 789 | 59 | 1,275 | 1,401 | 3,502 |
| Mar. .. | 421 | 671 | 67 | 1,158 | 1,436 | 3,777 |
| Apr. .. | 385 | 790 | 68 | 1,207 | 1,321 | 3,982 |
| May .. | 363 | 764 | 80 | 1,207 | 1,321 | 3,982 |
| June .. | 352 | 785 | 80 | 1,216 | 1,319 | 4,087 |
| July .. | 279 | 851 | 68 | 1,197 | 1,109 | 4,011 |
| Total Automotive | | | | | | |
| 1959 | | | | | | |
| June .. | 3,392 | 6,756 | 90 | 10,237 | 10,294 | 19,098 |
| July .. | 3,588 | 6,832 | 112 | 10,532 | 11,223 | 19,877 |
| Aug. .. | 1,249 | 6,595 | 114 | 7,957 | 9,683 | 21,730 |
| Sept. .. | 2,345 | 6,819 | 135 | 9,298 | 10,103 | 22,542 |
| Oct. .. | 2,966 | 7,166 | 136 | 10,269 | 10,884 | 23,151 |
| Nov. .. | 1,440 | 4,898 | 120 | 6,458 | 8,347 | 25,133 |
| Dec. .. | 3,200 | 4,567 | 181 | 7,948 | 9,649 | 26,955 |
| 1960 | | | | | | |
| Jan. .. | 4,333 | 6,833 | 156 | 11,322 | 10,325 | 25,943 |
| Feb. .. | 3,996 | 6,047 | 136 | 10,179 | 10,772 | 26,473 |
| Mar. .. | 3,753 | 5,827 | 157 | 9,737 | 11,115 | 27,921 |
| Apr. .. | 3,584 | 7,347 | 182 | 11,114 | 10,517 | 27,401 |
| May .. | 3,724 | 7,306 | 157 | 11,188 | 10,779 | 26,967 |
| June .. | 3,449 | 7,884 | 174 | 11,507 | 10,863 | 26,359 |
| July .. | 2,735 | 7,228 | 150 | 10,113 | 9,789 | 26,108 |

Source: The Rubber Manufacturers Association, Inc.

# U.S.A. Automotive Inner Tubes

(Thousands of Units)

| Year | Shipments: Original Equipment | Shipments: Replacement | Shipments: Export | Shipments: Total | Production | Inventory End of Period |
|---|---|---|---|---|---|---|
| 1959 | | | | | | |
| May | 363 | 2,853 | 59 | 3,275 | 2,752 | 6,849 |
| June | 392 | 3,421 | 59 | 3,872 | 3,683 | 6,999 |
| July | 317 | 3,564 | 66 | 3,948 | 4,345 | 7,560 |
| Aug. | 210 | 3,297 | 77 | 3,583 | 3,716 | 7,848 |
| Sept. | 347 | 3,258 | 88 | 3,693 | 4,065 | 8,334 |
| Oct. | 265 | 3,571 | 79 | 3,915 | 4,392 | 9,088 |
| Nov. | 163 | 2,867 | 67 | 3,097 | 3,756 | 9,918 |
| Dec. | 240 | 2,793 | 102 | 3,135 | 3,612 | 10,536 |
| 1960 | | | | | | |
| Jan. | 365 | 4,964 | 62 | 5,391 | 3,899 | 8,924 |
| Feb. | 370 | 3,553 | 87 | 4,011 | 4,043 | 9,002 |
| Mar. | 365 | 2,807 | 111 | 3,282 | 4,241 | 10,113 |
| Apr. | 330 | 2,862 | 114 | 3,306 | 3,628 | 10,495 |
| May | 307 | 2,932 | 91 | 3,330 | 3,611 | 10,852 |
| June | 295 | 3,154 | 98 | 3,547 | 3,426 | 10,670 |
| July | 242 | 3,102 | 94 | 3,439 | 3,261 | 10,627 |

Source: The Rubber Manufacturers Association, Inc.

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**MURRAY HILL 7-3034**


## U.S.A. Rubber Industry Economic Indicators

| | Production Index* | | | | % Return† | |
|---|---|---|---|---|---|---|
| | Total Rubber and Plastics Products Seasonally Adjusted, % | | Without Seasonal Adjustment, % | | On Sales | On Investment |
| Year | 1947-49 | 1957 | 1947-49 | 1957 | R&MP‡ | R&MP |
| | 100 | 100 | 100 | 100 | | |
| 1959 | 199 | 114 | 199 | 114 | 4.0 | 8.6 |
| Jan. | 189 | 108 | 198 | 113 | | |
| Feb. | 197 | 113 | 208 | 119 | | |
| Mar. | 196 | 112 | 206 | 118 | 3.9 | 8.0 |
| Apr. | 182 | 104 | 187 | 107 | | |
| May | 183 | 105 | 179 | 103 | | |
| June | 205 | 117 | 199 | 114 | 4.4 | 10.4 |
| July | 223 | 128 | 187 | 107 | | |
| Aug. | 210 | 120 | 203 | 117 | | |
| Sept. | 209 | 120 | 212 | 121 | 4.1 | 8.8 |
| Oct. | 201 | 115 | 211 | 121 | | |
| Nov. | 198 | 113 | 203 | 116 | | |
| Dec. | 203 | 116 | 194 | 111 | 3.7 | 8.0 |
| 1960 | | | | | | |
| Jan. | 206 | 118 | 216 | 124 | | |
| Feb. | 201 | 115 | 215 | 123 | | |
| Mar. | ... | ... | 211 | 121 | 3.8 | 8.0 |
| Apr. | ... | ... | 201 | ... | | |

* F.R.B. Index of Industrial Production revised to include plastics products and change base period.
† Base Data F.I.C.-S.E.C.-Quarterly Financial Reports—% Calculated by RMA.
‡ R&MP = Rubber and Miscellaneous Plastics, a classification revised according to the 1959 Standard Industrial Classifications.

■

## Station Wagon Tire

*(Continued from page 42)*

station wagons and named the Commercial. The tire, a truck-type tire designed to fit a passenger wheel, has six plies rather than the four used on a passenger car, and a tread depth equal to that of original-equipment tires used on long-distance heavy-duty trucks, Seiberling reports.

The tire will be carried in 14- and 15-inch sizes.

Frank Hager, manager of truck tire sales at Seiberling, says the standard four-ply tires used on new station wagons are overloaded "even before the gas tank is filled." In use they give motorists far less mileage than tires on conventional cars, and the motorist "is pushing the safety factor when he puts the family and packages in it," Hager declared.

## New Welcome Mats

Ace Rubber Products, Inc., is now marketing a new group of all-weather entrance mats known as "Glam-R-Mats." The mats have the word "welcome" set off in gold background and also feature a wide center section of perforated rectangles on a bias for a two-way scraping action, with corrugated panels around the edge for final wiping.

The mats are available in 36- by 19-inch size in black and brown. Another model, with a gold shield and coat of arms, comes in the 36- by 19- and 30- by 16½-inch sizes.

**"Parback Back-Up Rings."** Catalog 5482. Parker Seal Co., a division of Parker-Hannifin Corp., Culver City, Calif. 6 pages.

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CHEMIST B.S./M.S. WITH MINIMUM OF 3 YEARS' EXPERIence in the application of latex and resins to textiles. Position involves project work on carpet backing, adhesion of rubber and textiles, development of new resins treatment for textiles and similar assignments. Excellent opportunity. Write stating qualifications and salary requirements to Personnel Director, CALLAWAY MILLS, LaGrange, Georgia.

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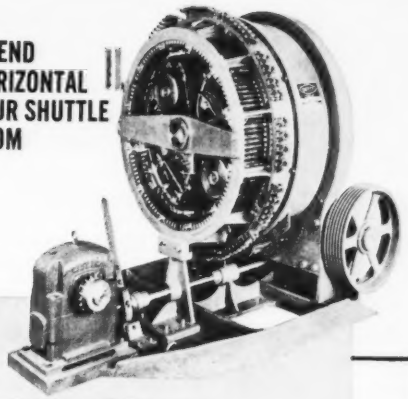

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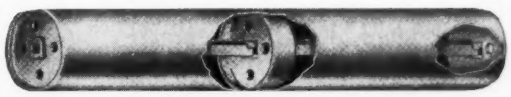

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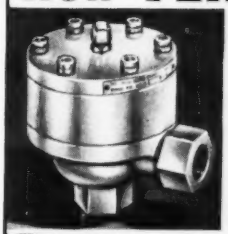

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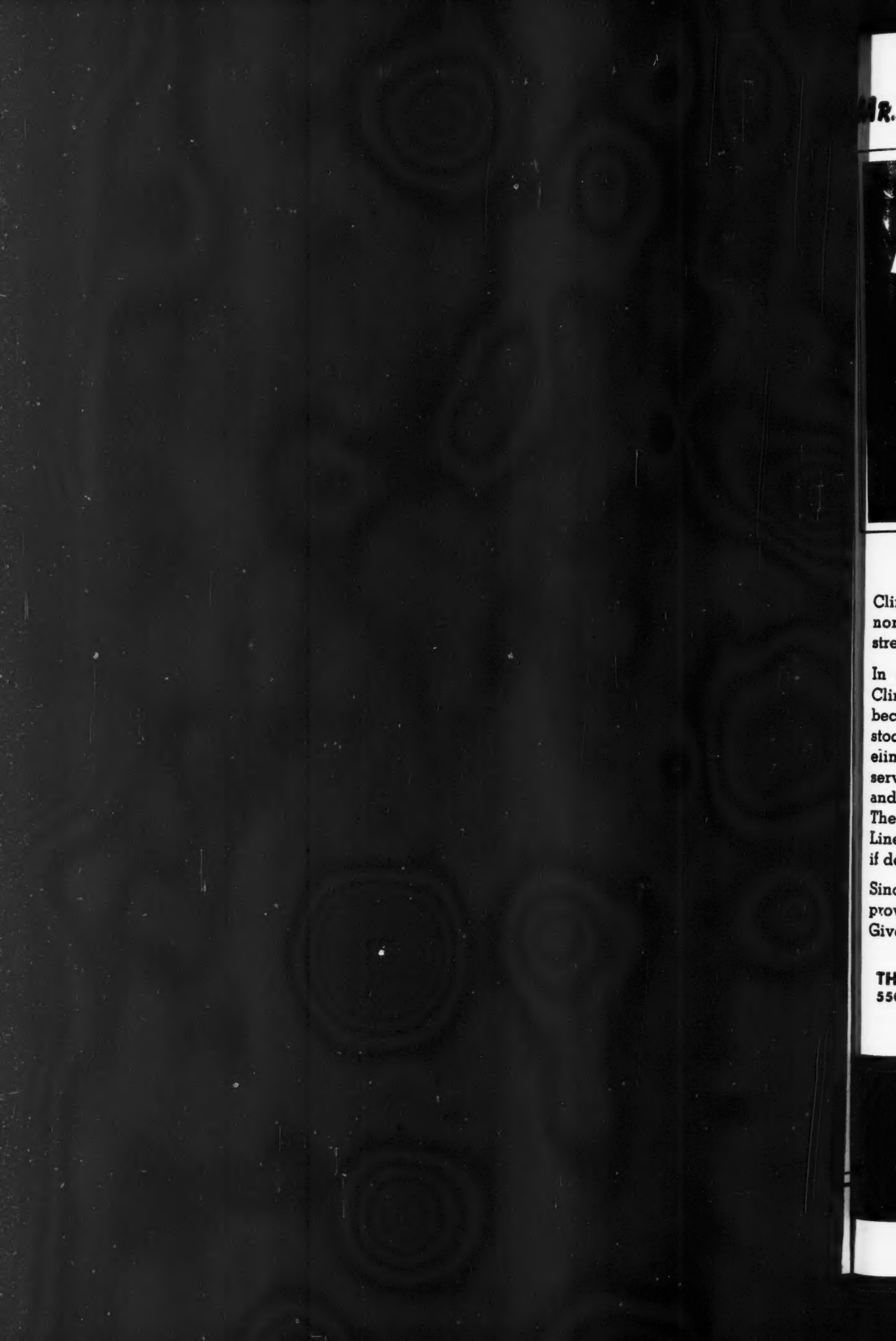

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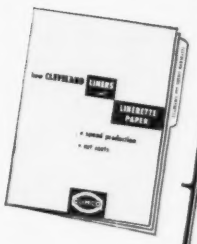

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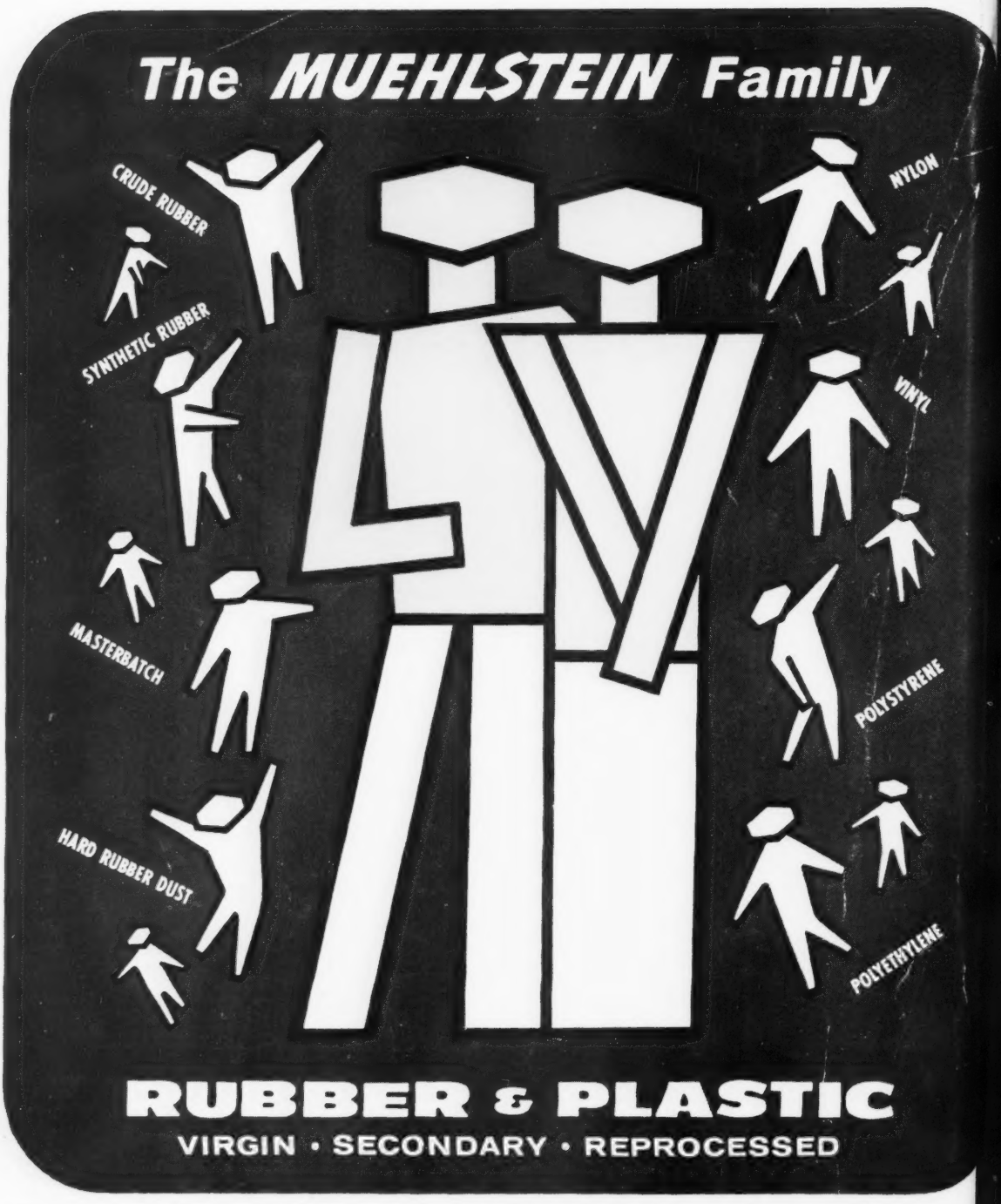


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